THE
CONNECTICUT SOCIETY
OF
CIVIL ENGINEERS
INCORPORATED

36

1919|1920

1920

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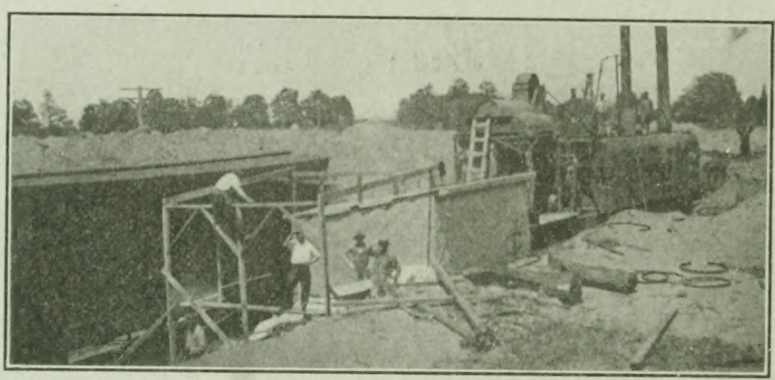

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The Connecticut
Society of Civil Engineers
Incorporated

Papers and Transactions for 1919

AND

Proceedings

OF THE

Thirty-Sixth Annual Meeting

AT

NEW HAVEN, FEBRUARY 17 AND 18, 1920

New Haven
THE TUTTLE, MOREHOUSE & TAYLOR COMPANY
1920

The Connecticut Society of Civil Engineers,

Incorporated

ORGANIZED AT BRIDGEPORT, JANUARY 15, 1884

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LIST OF EX-PRESIDENTS

WITH DATES OF SERVICE

*B. Hull	1884, 1885
Charles M. Jarvis	1886
Charles E. Chandler	1887
Charles H. Bunce	1888, 1889
*F. Floyd Weld	1890
E. P. Augur	1891, 1892, 1893, 1894
Wm. G. Smith	1895, 1896
Robert A. Cairns	1897, 1898
Edwin D. Graves	1899, 1900
Henry J. Kellogg	1901
*Clarence B. Vorce	1902
Frederick L. Ford	1903
John K. Punderford	1904
Albert B. Hill	1905
Charles F. Chase	1906
*Daniel S. Brinsmade	1907
Edward W. Bush	1908
Frederick J. Easterbrook	1909
Shepard B. Palmer	1910
Charles A. Ferry	1911
A. William Sperry	1912
Sheldon E. Minor	1913
George K. Crandall	1914
Charles C. Elwell	1915
Clarence Blakeslee	1916
Henry R. Buck	1917
William R. Dunham, Jr.	1918
Charles J. Bennett	1919

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* Deceased.

PRESIDENT'S ADDRESS.

Following the usual custom in completion of a year of service as President of this Society, I am supposed to make certain comments on the Society, its personnel, its general scope and other topics which may or may not be of interest.

It occurs to me that life may be compared to a journey. Success is measured by the height to which one climbs. Success comes in many different ways—whether material in the form of money, in fame or through accomplishment of different kinds of work. On our journey, as we proceed, we descend here and there into the valley of failure, but climb again to heights of accomplishment. Each height should be higher than the previous one until we reach our own summit and attain our fullest measure of success.

The point on which I stand as your President is one where I may pause and look about me with gratitude and some degree of pride. It is my duty to give you my impressions as they come. Of necessity and from choice, these impressions are tinged with whatever engineering qualifications your President is supposed to possess. As President, let me say that I am proud of the Society, first, as an engineer in love with his work; and, second, as an individual.

Let me record the impressions made on my mind at this time. The engineer is face to face with opportunity. We have previously said that we should popularize our profession; we should make it known that it is a profession upon a high plane. We may also say that as a result of several abnormal conditions, the public is becoming more cognizant of the engineer and his work. The value of this work is better known. Public and private construction is tremendous in its magnitude. We can find a prominent place if we seize our opportunity. Our profession will be popular.

We have reached the point where the demand for production exceeds the supply in almost every field of industry. The shortage is in the supply of labor. It is serious and liable to continue so; hence, substitutions for labor must be made and popularized. Undoubtedly, this is an engineering problem to which we must put our minds and our hearts. Every labor-saving device produced is a help to the general situation. Other and like problems are ours. We hear a universal demand for increased efficiency in government methods. The budget system is popular. As a companion to the budget system comes centralization of authority and simplification of operations. The engineering feature of this is the need for a National Department of Public Works. This need has been explained to the Society at one of its smokers by Mr. Leonard Metcalf of Boston. The Society has also been circularized on the topic. Money is needed. Here is our really first great opportunity really to function as engineers in the attempt to improve government methods. This is a proper line for us to follow. I hope that this matter may be thoroughly discussed during the business session.

Again, we see an opportunity to serve in the study of conservation problems, exemplified particularly in Mr. Murray's proposition to save coal by a consolidation of power units and the construction of what he calls a super power line. He intends to conserve coal and transportation by the wider use of electrical energy produced at properly located stations and distributed through coöperative methods to consumers. Countless possibilities present themselves. The benefit would be infinitely great. The obstacles seem so colossal as to be almost insurmountable. This problem should have our study and our help if careful consideration determines the project worthy. An active committee should coöperate in this study.

The above are some of the many possibilities that engineers find waiting for their attention. Surely, we have an opportunity for disinterested, unselfish service.

The different engineering societies find themselves in a peculiar and awkward position. Owing to the super-conservativeness of engineering membership in these societies, and possibly to the internal jealousies, associations such as our own and the National Societies have been rightly accused of neglecting their opportunities for service and for a reasonable and honorable advancement. As a result of this inertia, there has sprung into being an association of engineers, nation wide in its organization. This association has been accused of methods partaking of the nature of trade unionism. Certainly, some of their efforts have been selfish and unwise, but the American Association of Engineers has grown in strength, particularly in the Middle West, and has absorbed and included many societies such as our own. Such a result in Connecticut would be unfortunate. We are full of years and honor. We should do our duty unselfishly and attempt no service as a society which could or might bear the stamp of commercialism. I should welcome a full and frank discussion of the American Association, but should oppose any attempt to merge this Society in it. Nevertheless, unless we take our full part in public affairs and in the legitimate advancement of our work, we shall unquestionably see our Society die of dry rot or become an abiding place for doctrinaires. Local engineering societies have a definite place in the community life. Our membership should be known and respected. Do we serve as we should?

The relations between the American Society of Civil Engineers and this Connecticut Society should be strengthened. As a member of both groups, I can point out some dangers.

There should be no attitude of superiority on the part of the wearers of the blue shield. There should be no pique or jealousy on the part of Connecticut men. Each has its field of activity, its opportunity for service. Our Society fills a local need and will continue to do so. The American Society has its field and needs to pay attention to its duties or its field will be ploughed by other agencies. We must all strive for harmony. Joint meetings of the engineering societies of all branches are suggested.

Such societies as ours are evidently a meeting place on common ground where engineers and contractors should adjust their differences and find a solution amicably for their misunderstandings. I regret that engineers and contractors have so little confidence one in the other. Our work is the same in the broad sense. Engineers and contractors should aim at excellence, not blaming each other for failures. Both are at fault if failures occur. We should have no patience with the contractor who lays all blame on the specifications, nor with the engineer who brands all contractors crooks *per se*. It is true that many engineers are narrow minded, arbitrary and opinionated. They should be educated or they will be forced to one side. There have been, and possibly still are, contractors who are only concerned with profit, even at the sacrifice of excellence. They should be eliminated. The proper relation of engineer and contractor, with all the accompanying features of contract, specifications, interpretation, adjustment and the like, is a proper topic for careful study of this Society, and is suggested as a problem for a special standing committee.

As this meeting proceeds, the programme is designed first to interest engineers in lines somewhat outside actual civil engineering practice; and, second, to call attention to some of the features of the engineering work done in this State during the past year. The programme is broad in its scope, and we are fortunate in the ability to get speakers on so many topics.

You will hear from the Secretary regarding the activities of the Society and its financial condition. He will point with pride and honor to the accomplishment in securing new members. Not within the history of the Society have so many names been added to its roster in any one year.

Let me here say a word in commendation of our present Secretary. In spite of ill health, he has been a very material help to your President in developing ideas for the advancement of our meetings and the betterment of our Society, and I wish to personally thank him and suggest to the members that the position of Secretary is one which carries with it a large amount of work and responsibility, and could well be paid more than the miserly stipend at present allowed.

Let me here also say a word with reference to the older members of this Society. Those who are the deans of the profession and the wise heads of the council. It is a pleasure to us all to see these men rimed with the frost of advancing years sitting with us in these meetings and enjoying with us the same pleasures which they so richly deserve. It is a pleasure to me, personally, and I know to the Society, to greet here such men as "Daddy" Bunce, Edwin P. Augur, Charles E. Chandler, William G. Smith, and dear old "Hal" Kellogg, who were added to the honorary membership of this Society as a very small token of our appreciation. May they live long and prosper.

Let us also pause for a moment in silent thought of those who have passed on.

In conclusion, let me express my thanks to those who have aided in the preparation of the meetings. We are particularly indebted to the Blakeslee Company and the Connecticut Light & Power Company for the summer meeting, as we are also indebted to the different men who have worked to make successful smokers during the past year.

There are many things which have been omitted in this brief address, but it contains a world of love for the profession and for our particular little portion of the profession as typified by the Connecticut Society of Civil Engineers.

SOME WAR TIME DEVELOPMENTS IN ELECTRICAL COMMUNICATION AND ALLIED FIELDS.

By Dr. F. B. Jewett, Chief Engineer, Western Electric Co., New York City. During the War, Lieutenant-Colonel in Signal Corps. Also, member of Anti-Submarine Board, U. S. Navy.

Mr. President and members of the Society, I don't know whether what I have to show to you this afternoon and talk to you about has any very near connection with civil engineering, but you may find the pictures somewhat interesting and possibly a little of the history connected with the pictures may not be amiss. What I am going to tell you about this afternoon are a few of the war time developments in electrical communication which came under my personal observation during the war; and as a preface to the pictures it may not be amiss to give you a little of the history which led up to my having a rather intimate connection with some of the work of the Signal Corps in the Army and for the Navy, in connection with anti-submarine matters.

You may remember that about a year before we got into the war, the administration and Congress, in a somewhat belated attempt to put us on a preparedness footing, passed an Enabling Act which permitted various corps of the Army and Navy to organize reserves of officers and men from civil life, to commission officers and enlisted men, with the idea that in the event of necessity we would have at hand forces which could be called into service. Some of the corps for the Army and Navy did pretty good jobs and others did poor jobs. The Signal Corps attempted to do a first-class job and set about it in what seems to me was a systematic fashion. They appreciated that in the event of our having to go overseas with any large force of men, the matter of communication would be of vital importance because, from the very nature of the battle line in the west, it was clear the men would have to go from the east end of the line, and that meant that not only would communication be required in the fighting area, but there would have to be long lines of communication to base points from which supplies would have to be sent forward.

For that reason it would be necessary that they have, almost at the outset, a thoroughly equipped signal corps organization, and, as the telephone and telegraph business of this country is in the hands of a few large corporations, the Signal Corps went to the most eminent of the telephone engineers of the country, Mr. Carty, Chief Engineer of the American Telephone & Telegraph Company, and through him enlisted the support of the Bell Telephone Company and of the Western Union and Postal companies. About December, 1916, they had organized 3.500 to 4,000 Signal Corps troops, properly officered and with the men all selected with special regard to their fitness for the duties they would have to perform.

As a part of the whole scheme, the Chief Signal Officer, General Squier, who had been our military attaché in London and so had seen some of the workings in the early days of the war, realized that a research and development organization would be a very necessary part of the whole scheme in the event of our having anything large to do. As the laboratories of the Bell system and of the Western Electric Company are the largest laboratories of their kind in the world, he commissioned a number of us there as officers of the Reserve Corps, with the idea that in the event of hostilities we would be called into active service and they would practically commandeer those laboratories and turn them over into Signal Corps laboratories. That is how I came to be mixed up with the Signal Corps end of the work. I think I was the second Major in the Signal Corps called into active service, and I can well remember the funny feeling I had in putting on a uniform at a time when a uniform was a rarity in New York City; and when even the street car conductors refused to take our fares and the conductors on the railroads would not punch our commutation tickets. They got over that.

Almost at the outset of the war, within a few weeks after war was declared, the Secretary of the Navy asked three of the electric companies of this country, the General Electric Company, the Western Electric Company, and the Submarine Signal Company of Boston, to coöperate with each other and with the Navy in attempting to solve one phase of the submarine menace, namely, that of detecting the submarine, and for the purpose of carrying on that work he created a Board known as the Submarine Board—a special board on anti-submarine devices, headed by Admiral A. W. Grant, and appointed Dr. Whitney of the General Electric Company, Mr. Fay of the Submarine Signal Company, and myself, as civilian members—advisory members of that Board. Later on Dr. Milliken of the University of Chicago, who was an officer of the Signal Corps, was added to the Board, to represent the National Research Council and we four civilians served on that Board from the day the Board was created until the Board was disbanded last year. As a result of my serving on that Board I came to know very intimately the workings out of all the problems which had to do with anti-submarine devices, some of which I am going to show you on the screen. It was under the auspices of that Board that a very large experimental station was established at New London followed by the establishment of a smaller station at Nahant, Massachusetts. At the time of signing the armistice there were some 3,000 people employed in New London in connection with experimental work on anti-submarine matters.

While the laboratories of the Western Electric Company started in primarily as Signal Corps laboratories, and for about six or eight months were practically devoted to that and to anti-submarine work, the fact that they were peculiarly well equipped for certain classes of work soon brought them into requisition for other services, one of which was the matter of developing an apparatus for locating the positions of big guns by what is known as sound rings; that is, the ability to locate the position of a gun accurately by means of the sound, the disturbance produced when the gun is fired. The idea was developed very early in the game by the British and French, and proved such a useful tool that immediately the United States entered the war, the problem came to the fore as one of the major scientific problems to be solved. The work was put into the hands of Professor Trowbridge of Princeton, who was commissioned in the First Signal Corps and later with the Engineers, and the development and manufacture of the special apparatus required for that service was entrusted to the Western Electric Company; and all of the sound-ranging apparatus which was used by our troops, and some which was used by the British—

I will say all used by our troops except a little purchased from the French—were manufactured by our laboratories at West Street.

So far as I know the matter of sound-ranging equipment during the active period of the war was the most closely guarded secret of the war. It was very closely guarded for the reason that the Allies had reason to believe that they had a better means, a better apparatus for locating the position of enemy guns than did the Germans; and for the further reason that they did not know of any of their secrets having leaked out. The result was that when we were set at the task of developing and completing this apparatus, we were impressed with the necessity of keeping everything very secret; and when we set to work to manufacture this apparatus the pieces were manufactured under faked names and in different places, and the assembling work, which was normally entrusted to mechanics, was actually done by two or three very high-priced and reliable engineers, who with their own hands assembled the apparatus, adjusted it, tested it out, boxed it up, sealed the boxes, and turned it over to the military forces for shipment to France. As a matter of fact, although I was in uniform and in charge of these laboratories, I found it difficult to get into the rooms where this work was done. The guards were very suspicious of everyone, and unless you had proper credentials, they would not let you in. Whenever the rooms were left, the locks were sealed and the seals stamped with the time, and were not supposed to be opened except by properly accredited officers.

That gives you, in brief, a little picture of my connection with these three things which I am going to show you a little bit later in the way of pictures. Now, a word with regard to some of the things which were done in connection with communication. In the first place and as an evidence of how well done the preliminary work of organizing the Signal Reserve Corps was, I will say that before General Pershing and his Signal Officer, Colonel—later General—Russell, and Chief Signal Officer of the A. E. F., before they sailed for France, the entire first batch of lines of communication to be installed for the American forces had been worked out on this side in detail, and the apparatus was actually under order and the equipment was actually in process of being assembled for dispatch to France.

The first line—those of us who were entrusted by the military authorities with knowledge of what our plans overseas were—knew exactly where these lines were to run, knew what troops in general were to be served, and were put in full possession of all information necessary to the preliminary engineering of putting these permanent lines in communication. These lines were to be equipped with the most modern telephone and telegraph apparatus, in standard American fashion, including the multiple printing telegraph. An indication that the work was well done is the fact that practically the first 600 miles of communication were laid out identically as they had been planned on this side. It was a great tribute to Colonel Carty and the men particularly engaged in that work that they, civilians, with a rather meagre amount of military information given to them, could plan and execute the work many thousands of miles from where the plant was to go in.

There were one or two amusing things connected with that particular phase of the work. While the civilian troops were entrusted with the planning of this whole line of communication, and entrusted with getting the material ready for shipment overseas, for some reason or other they decided that the civilians didn't know anything about shipping this kind of material, and that from the warehouses where the stuff was assembled, the regular army authorities would take charge of the material. Well, that was all very nice, and things appeared to be going well until most violent telegrams began to be received, signed "Pershing." No material had arrived, or it had arrived in peculiar fashion. Finally, in desperation, they got this same civilian crew in and told them they would have to take charge of the shipping. And this is what we found: of course, there were many kinds of material to go overseas—many carloads of picks, shovels, poles and what not, and of course it was easier to ship all the picks together, and all the shovels together, and this crew that had been originally entrusted with the shipping had been in the habit of putting all the picks on the ship that was going to Liverpool, and all the shovels on a ship to Bordeaux, and the poles to Havre, with the result that our men in France were trying to dig post holes with picks, and the material was not being gotten together over there. That was finally straightened out, and things went ahead.

Aside from the magnitude of the job of getting together and installing the permanent lines of communication, there was very little that was new in the way of wire communication, either telephone or telegraph, as a result of the war. That is not surprising, because the art of telephony and telegraphy had been so well advanced in this country that practically all that was needed was to apply rather well-known commercial principles to the peculiar needs of war time service. There was not much need or occasion for new developments in wire communication.

That was not true with regard to the radio art, which even to-day is essentially an undeveloped art; and, of course, in some situations all marine work and many of the kinds of communication with land forces and airplane work, it is the only means of electrical communication which is at all reliable.

As you know, the airplane program was started quite early after our entering into the war. Vast sums of money were appropriated for this tremendous fleet of airplanes which we were going to furnish, and very shortly after the program was launched, the question of how we were going to operate these fleets of airplanes came prominently to the fore. I think it was along in the middle of May, 1917, I received an order from the Chief Signal Officer to attend a meeting in Washington to discuss how they were going to communicate between these airplanes. At this conference there were present the officers from England and France who were supposed to be experts in this line of work, and the whole problem of their then situation and what they hoped to be able to do when they got more airplanes, was laid before us and it really was a very pitiable condition because at that time they had no good means of communicating between these airplanes, or from the airplane to the ground. All they had were either visual signals or in some cases a rather unreliable form of radio telegram, and the plans then under contemplation, which were going to call for squadron operation of these planes, called for a very much more reliable and expeditious form of communication.

After we discussed this matter thoroughly, the French and English officers were frank to say that so far as they could see, the only thing which would be satisfactory would be some form of radio telephone, some means by which the words of command could be given by ordinary voice methods, so that they could command these squadrons much as an officer would command a squad of men. The problem was put up to us—can you develop a radio telephone which can be operated at short range and which will be thoroughly reliable and can be operated on these airplanes? It was a pretty stiff question to put up to us. What we were asked to provide was a radio telephone between two planes, or from the plane to the ground, enabling a command to be given in an ordinary tone of voice, not as loud as I am talking now, and at a time when it was physically impossible to hear yourself talk in one of these planes. The unmuffled exhaust from the engines and the whir of the propellers made such a racket that you could not hear yourself talk. We were asked to transmit energy, in some cases a number of miles, and have it come out in a telephone so that a man could hear it. Fortunately we had done a certain amount of work and had some basis for believing that we could solve the problem, although the thing had never been done. I told General Squier that I thought the problem was not an insoluble one, and we have at the present time as our own prized possession, the little order given to me, about three lines long, ordering me to proceed to develop a radio telephone for use between airplanes and have it done as soon as possible. Very easy to write the order, but not so easy to carry it out.

If I remember the facts correctly, I think the conference took place on the 17th or 18th of May, and it was either the 3d or 5th of July when we had the first try-out of rather crude laboratory apparatus at the field at Old Point Comfort and the thing worked. It worked so successfully, or gave indications of working so successfully, that the next order was to produce this apparatus in more stable form, and in a form which could be manufactured. So that the summer of 1917 was spent in getting this equipment into somewhat final form. You all remember how chaotic the whole airplane program was at that time, and considerably later. So you may imagine our difficulties. We had no planes. We didn't know what the final form of plane would be. Our sailing directions were changed every twenty-four hours and sometimes oftener. We didn't even know what kind of an engine the final engine was going to be, or how much space we were going to have for putting this apparatus in. But a reasonably final form of apparatus was in shape by about Thanksgiving time, 1917, and it was decided that we would have a formal try-out of this apparatus at Dayton, Ohio, on the day when they were going to have the first try-out of the Liberty engine on the Haviland planes.

The Aircraft Production Board, then in control of the whole aircraft program, was going to make a tour of the country, and was going to end up on the Sunday after Thanksgiving Day at Dayton, for this official try-out. One of us was invited to accompany this august body, the Production Board, and various Army and Navy officers, many of them of high rank, and we spent a few very interesting days in Buffalo and Detroit to see what was going on in the way of getting ready to produce this vast fleet of airplanes. Incidentally those of us who had this matter of communication in hand, suffered a good deal of banter. Most of these people were from Missouri and they didn't believe such a thing as a radio telephone on an airplane was possible. They jollied us a good deal.

We got to Dayton on Sunday morning. It was a beautiful morning, and we spent the time witnessing the flights of these new airplanes and had a nice lunch at Colonel Dean's house. After luncheon we went out on a little hill back of the house, where a temporary radio station had been installed. I think there were thirty or forty people in the party. To give everybody a chance to witness the thing to the best advantage, we had rigged up some loud-speaking telephones so that everybody could hear what the planes had to report. Two or three planes with this telephone were sent up, and the operator in his hut began to tune up, and pretty soon a few squawks and squeaks came out of the loud-speaking receivers. After a while we could hear the talking and hear the replies from these airplanes. It was a very startling demonstration of the whole apparatus. The planes were put through certain evolutions and followed out the words of command. We heard the orders given and heard the replies, and could see the planes making the evolutions. I think on this occasion, or at another demonstration of very nearly the same kind, one elderly officer, I think he was an admiral in the Navy, who evidently thought there was some shenanigan about this whole business, decided he would take a hand himself, and prove to himself that it was all right. So he said he wanted to direct these airplanes. He went in and put the receiver on, and the transmitter up to his mouth, and sent these planes on a scouting expedition. Did they understand him? Yes, they did. "I am going to send plane No. 1 off in this direction, No. 2 in this direction, and No. 3 in this direction, and you are to go until you get orders to come back. Do you understand?" Yes, they understood. "All right," he said, "Go. I want you to report what you see." They beat it in all directions and were soon out of sight. And they reported back what they observed. Finally he called up to one of these planes to report where they were, they having been gone maybe five minutes, and they said, "We are over Germany." That was rather startling information, and he said, "How do you know?" And they said, "We are over a hell of a great big brewery." He was satisfied and told them to come back.

Up to that time our troubles had been great. They were greater, following that, because they began talking of having some 10,000 planes ready for service in France in the late spring of 1918. The demonstration had been apparently so successful that we were told that unless radio telephone equipment was available for all of these planes, the whole airplane program was going up the flue. Up to that time, as you will see from the pictures, the essential part of a short-range radio telephone set was what is known as a vacuum tube, developed some years ago as a detector of radio signals. It is a wonderful device, probably the most wonderful tool in the hands of electrical engineers, and it serves a multitude of purposes in the radio telephone set. In the form it is required for radio telephone purposes, it has to be a very exact piece of apparatus, and up to the time of this demonstration, Thanksgiving, 1917, probably not more than 200 of these tubes per week had ever been manufactured in this country. They had all been manufactured in laboratories by Ph.D. type of people.

Immediately following that demonstration, we were told we must have these sets, with all their vacuum tubes, out by the thousands. The schedule of deliveries on things like these vacuum tubes which was placed upon us, called for deliveries in excess of 25,000 of these tubes a week, beginning in the late spring or early summer of 1918. So there was a tremendous problem in manufacture before us, requiring that all these physical laboratory measurements and methods should be reduced to shop practice. Skilled operators, boys and girls, men and women, had to be collected and these things had to be turned out in huge quantities.

You know what happened to the airplane program. I want to say that, whether the radio apparatus was good, bad or indifferent, there never was a time when there was not sufficient radio apparatus available for all the planes and many more than we ever had or the Allies had, and at the signing of the armistice these vacuum tubes were being turned out in excess of 30,000 per week—good tubes. When you consider the mortality in the process of making these tubes is in excess of fifty per cent, it meant that there was quite a good deal of glass blowing and pumping out of air that had to be done.

Just about the same time this demonstration was made at Dayton, which proved to the satisfaction of the military authorities that the radio telephone was what they wanted for their airplanes, the detection work for the submarines down at New London had progressed to a point where reasonably successful forms of submarine detecting apparatus were available. As you will see from the pictures, they were forms of apparatus which required the use of small boats and they required the use of these boats in squadrons, and the problem of communicating between the boats of the squadron was practically the same as the problem of airplane communication.

Various forms of semaphore signalling and radio telegraph signalling had been tried and found unsuccessful because they were too slow. Semaphore signalling of course could not be used except in clear weather, and the radio telegraph required the use of two operators between the commander of a squadron and the captain of each boat. So they immediately jumped to the radio telephone, and it was tried out at New London and was eminently successful, with the result that in addition to the airplane demand for this type of apparatus, there came a tremendous demand for a short-range radio telephone for this submarine chaser service.

Of course the practical failure of the airplane program meant that relatively a small amount of radio telephone apparatus was used effectively in that service, although vast quantities of it were manufactured. That was not true in the case of sub-chasers.

I presume that in that case, on destroyers, sub-chasers and boats of that class, the radio telephone really played a very effective part in the operation leading up to the successful conclusion of the war, and it was really a very remarkable sight.

Probably some of those in the room here have been at New London in the days when we were training the crews of the sub-chasers, and have seen the evolutions of a fleet of chasers under the command of an officer using the radio telephone as a means of communication. I have been down on the Sound here a number of times and have gone out with these crews after they had had a little practice, and it really was a startling sight to see these chasers in action, four or five spread out in a line from five to ten miles; a submarine allowed to go down and submerge for an hour and sail any speed, any course, any direction—the only thing they could not do was to go down and lie on the bottom—and the sub-chasers chasing them.

The type of apparatus in vogue at the early stages was a type of detecting apparatus which required the sub-chasers to stop, look and listen. You would see this whole fleet of boats going along in line, abreast. The order came to stop, and all these boats would come to rest. They would put down listening tubes and listen, and you could not see what went on in the other boats, but you could in your own boat. Listening tubes were put down, and the location of the submarine was determined and reported back on the radio telephone. On the Commander's boat it came out through a loud-speaking receiver, so you could hear it all over the boat. As these reports came in, they were plotted—the direction in which the submarine lay with regard to each one of these boats, and in about thirty seconds from the time the order was given to stop these boats, the Captain was in a position to order these boats to go ahead again on a new course for a certain distance. He would give this order in an ordinary tone of voice and we would look out and see this whole line of boats start off at full speed in another direction. Of course, those who were mixed up in the thing got into it gradually, and did not appreciate the wonder of the thing. When you stop to think, it is quite wonderful to be able to talk back and forth and have your message get across without any difficulty.

That, I think, gives you a general picture of some of the things with which we had to do, and as we go along I will explain a little about the details of some of the pieces of apparatus.

First I am going to show you a few pictures with regard to line conditions under which the permanent lines of communication were established.

Dr. Jewett showed over 60 pictures. It was impossible to reproduce them in a book like this and a selection of a few could not be made that would be adequate. So a report of his lecture is continued, referring to pictures not printed, to get the accompanying remarks that are interesting without the pictures.

This picture is merely of an American pole line, standard type of construction so familiar to all of us, along one of the French highways—one of the first 600 miles of line which I spoke of.

This is a picture of one of the trenches, and shows the way in which wires had to be run, and shows you how difficult and how far from standard peace time conditions, were the conditions under which the signal troops had to maintain communication.

This is a picture of one of the field stations, showing the conditions under which field apparatus had to be operated. The apparatus was not different in its essential parts from standard telephone apparatus, but the conditions under which it was required to be used were such that rather special types of construction had to be used.

This is an entrance to a German dugout in which was established a communication office. It shows the way in which they ran their wires into one of their dugouts.

This is a German central office, somewhere in one of the back areas, and gives you some idea of the type of line construction which was employed by them. A substantial form of construction, but quite different from that employed by the Americans.

This is an entrance into an American dugout, in which there was established either a telephone or telegraph central office, and shows the way in which the wires were run there.

This is a picture, I believe, of a Belgian using field apparatus. just about the same general type of station that was shown in one of the earlier pictures.

I said there was not anything very much new required in connection with line communication by telephone or telegraph. This picture will indicate that to any of you who are at all familiar with standard telephone construction. This represents the front and back views of a standard telephone repeater and amplifier, one of the things which makes long-distance telephony possible, and the only difference from standard central office construction is the peculiar way in which the apparatus is mounted.

This picture shows a rather interesting phase of the development—a portable telephone or telegraph exchange. After we had been in the war a little while, word came back from the other side that General Pershing required a certain number of portable telephone or telegraph exchanges, so if he had to move his headquarters rapidly he would not be out of communication for any great length of time. The result was that both on this side and in France, American signal people got together a number of portable telephone and telegraph outfits mounted on automobile trucks.

This is a picture of just a section of one of the telephone central offices established in France and operated by girls from this country. If I mistake not, this was taken in Tours. It is a standard central telephone office of the most modern type, with American operators on the board. They tell an amusing story about this central office. One of the signal officers went in there and got talking with the chief operator, and it seems she came from Boston. He asked her how she liked it in Tours, and she said she liked it all right. He said, "How does operating compare with operating in Boston?" "Oh," she said, "about the same, only I have a better switchboard over here than I had in Boston."

This is one of the laboratories in New York, and shows a set up of printing telephone apparatus being tested out before being shipped to France. All of the lines in France except a few French lines were equipped for handling a vast quantity of telegraph messages over a multiplex printing telegraph outfit. All of this apparatus was made in this country and sent overseas. Great numbers of six- and eight-channel multiplex printing telegraph sets were put in service. I believe they operated their multiplex lines clear through from Tours to Chaumont. Thousands of messages were handled daily.

Here is a picture of those two motor offices, one telephone and the other telegraph, out on West Street just before they were loaded on board ship to go overseas.

The next picture shows the inside of the telephone office and shows again that the type of construction was essentially the same as was employed in any ordinary telephone office.

This is a type of apparatus which is quite familiar to anybody who has had signal corps experience, and is the camp switchboard or portable type of board for connecting up a limited number of lines, magneto lines. It was very largely used by signal troops where the lines of communication were not actually permanent.

This shows one of these boards set up, somewhere in France. You see the operator plugging in, as required.

This type of apparatus is a hand set, with magneto box which went with it, and was used at the outer ends of the lines, connected together through the camp switchboard.

This is a camp switchboard, somewhere out in the field.

This is a picture which represents one of the few rather unique things which resulted from the war, so far as wire telephony was concerned—what is known as the monocord type of switchboard. The original idea came from France, but it was rather improved upon in this country and great quantities of this type of apparatus were manufactured here and used by the American troops. The unique feature is that the whole thing is made up of units shown here on the left, each unit consisting of a set of line terminals with protecting apparatus shown at the top, signalling apparatus and a jack and plug-in cord, so if you wanted to assemble four of these units together, all you did was clamp them together. If you wanted twenty, you put twenty together and you had as many plugs and cords as you had jacks for lines connected together.

This was a somewhat unique development in the way of wire communication, which grew out of the war—what is known in our signal corps as the buzzer 'phone, and in English service as the Fuller 'phone, and is in effect a secret method of telegraphing. It is impossible, unless you have the right terminal apparatus, to get any inkling of what is going over a grounded wire, even though you can tap the wire, and it is impossible even with the proper terminal apparatus to get in communication by inductive methods. So that the apparatus was an effective tool where there was any likelihood of the lines being tapped.

Here was a development which also originated with the French, but which was greatly enlarged and improved upon in this country, a sort of hybrid wire and wireless type of apparatus. It came to us immediately after our entrance into the war, brought over here by the French Scientific Commission and is in effect a one-way inductive type of telegraph apparatus used by parties who might be cut off by barrage fire at the front, to signal back their location and to guide the rescuing party. The top picture shows schematically what the thing consisted of. A man carried forward a power buzzer with a couple of pieces of wire and a couple of grounding rods. If they were cut off and wanted to signal back, they grounded the wire, the two wires shown here, and made dots and dashes with this power buzzer. By inductive methods through earth currents, these signals were picked up by a paralleling wire some distance in the rear, two or three kilometers, and by means of one or more of the vacuum tube amplifiers were amplified up so that the weak signals which came in over this pair of wires were made audible in a pair of 'phones. It was a one-way telegraph, known as ground signalling or T P S, and was said by the French to be a most valuable form of signalling apparatus.

As soon as our people got hold of it they wanted to do something better with it than the French, so they said there would have to be a two-way form. There was constant and hard usage of this type of apparatus. That was the first real problem that was put up to us to develop, and it came a few days after war was declared. We were told to develop a two-way working apparatus, lighter than the French had, and more rugged. And that is the way the thing finally came out, a combined transmitting and receiving ground set which weighed only a few pounds. It was constructed essentially water-tight, capable of being submerged in two or three feet of water without damage. Another test was to lift it six feet from the floor and drop it on the floor without busting it. I forget how many thousands of these were made, but they were quite successful.

Now we come to the radio telephone, and I will show you two or three pictures of this vacuum tube. This is a picture of the transmitting tube, a glass bulb with a base, and the terminals coming out here at the bottom, four of them, mounted in a bayonet type of joint.

This is the transmitting tube, used in the radio telephone sets, and this is the receiving tube. The elements inside of the bulb are exactly the same in character, but not in dimensions and general arrangement. The base is practically the same, and the difference in the tube is occasioned simply by the difference in the service it has to perform.

This picture shows schematically the working parts of the tube. It is the same tube that is used in these telephone repeaters which are employed on land lines. You may forget for the moment these two things on the left, and consider simply this V-shaped affair in the center, and this fence-like arrangement to the right, and the plates to the left. There are three essential elements in the vacuum tube. This whole apparatus is contained in a vessel from which all of the air has been taken out, all of the air and all of the gas, and not only that which was inside of the tube, but that which was inside of the metal itself. This V-shaped thing is the filament, and serves two purposes. In the first place it serves to produce the little carriers which enable the electricity to be carried across the evacuated space; in the second place it serves as a common terminal for the circuits. This grid-like structure is the valve of the circuit, which enables you to regulate the flow of electricity across the evacuated space, and this plate forms one terminal of the output circuit. In operation what you do is to keep this filament heated to a bright red heat by means of a battery. As soon as it is heated to a bright red heat, it begins to give off those little carriers of electricity inductively. If, however, you put on another battery and connect one terminal of the battery to one corner of this filament and the other to this plate, you draw all of these little carriers across from the filament to this plate through this grid, and you will find, if you have a measuring instrument, that the current flowing will be greater or less, depending on how big this battery is. If, now, I interpose this grid-like arrangement and connect that grid around this same corner—these two grids happen to be in parallel and this wire comes around here—if I apply an electrical potential, a very small amount of electrical energy to this grid, the effect is to open or close the stream by which the energy flows across the filament to the plate. I have the same sort of analogy that I have in a water pipe where a man with a small amount of energy on a valve can control a large amount of energy in the output circuit. That device is what we call a distortionate amplifier. If you take a picture of the energy which comes out on the output side, you will find that the picture of that wave form, of that energy, is identical with the wave form of the energy which goes into the grid circuit, the only difference being that it is many times magnified. With the ordinary vacuum tube the energy amplification between the intake and output side is about a thousand times as much energy out as you put in, that comes from that local battery. It is exactly the same form as the stuff that you put in.

This picture represents a three-stage amplifier, in which you amplify a thousand times in this first bulb, and then you take that energy and pass it into the filament circuit of the second amplifier, and then into the grid circuit of this amplifier, and then out here you get the energy which is a thousand million times as great as the energy you put in at this side, but with a wave form which looks identically the same as the one you started with. In other words, you have the possibility of making audible or visible electrical energy which, to start with, was so minute that you had no means of detecting it. It was that property which DeForest employed in his detectors of wireless signals.

This next picture shows about the limit it is possible to go with a multi-stage amplifier of this type. This is a seven-stage amplifier in which you do seven times the thing which I have just described to you, so you can figure out how much energy you can get out here in comparison with what you had on this side. You get an amplification of a thousand for seven stages. Someone said that amplifier would enable you to hear a fly spit at a distance of forty miles. I don't know whether it is true or not.

That vacuum tube, as I said some time ago, is the heart of the whole wireless telephone system. It serves a number of purposes. In the first place it serves to generate the current which it transmits; it serves to modify that transmitting current by ordinary telephone current; it serves at the receiving end to detect that current that comes in, and to amplify it, and serves to take out the high frequency current, leaving you with an ordinary telephone current.

In radio telephony the problem which you are up against is the problem of first producing current, ordinary telephone current such as you use on wires, getting it in some form that you can get it into space, radiate it into space, picking up a minute part of it at some distant point and making that very minute amount of energy audible in the receiver you put on your ears. Now, the ordinary telephone current is of relatively low frequency, under 2,000 periods per second. It has too low a frequency to be radiated into space from ordinary wireless antennae. If you use a current which is high enough in frequency to be radiated from antennae, it is above audible range. We found, by the use of a device like this vacuum tube, you could create high frequency current which you could radiate. You could mix an ordinary telephone current with it, and the thing which you send into space, modified by your low frequency current of your telephone set, if you could pick that energy up and amplify it, and you could, by the same device which you used in generating the current, and take out the high frequency current at the receiving end, and have left the thing you started with.

This picture shows at the top a replica of an ordinary telephone current, produced by an ordinary transmitter, when you talk into it. This is a high frequency current which is produced by one of these vacuum tubes hooked up through a resonating circuit so as to give continuous high frequency current. This may be 50,000 or 1,000,000 frequency current, if you like, and this is 2,000 frequency. When you mix the two together in a vacuum tube, you get a thing which looks like this high frequency current, except that the tops of the waves are cut off to correspond, to get the low frequency current up there. If you radiate this thing into space and pick it up and amplify it at the receiving station, you get back a thing which looks like what you had at your transmitting station. If you take out this high frequency current, this is what you have left, this thing at the top. It sounds simple, doesn't it? As an electrical problem it is relatively simple, far more so than most of the wire telephone problems which we have. The only difficulty which we encounter in this airplane apparatus, is producing the result you want with an apparatus of limited size and weight. It is relatively a very simple problem so far as that part of it is concerned. One point is that the speech is not distorted by distance; no matter how far you go, the quality of the speech is the same. The only distortion produced is in the transmitting and receiving apparatus. That is a condition you don't meet in ordinary wire telephony.

This picture represents the first of the airplane sets which was devised. The wireless part of the apparatus is shown here to the left, the controls being on the front of the board, and these little windows here are to enable the observer to see whether the vacuum tubes are burning or not. This is the connecting apparatus and the adjusting apparatus. An interesting feature was when we started we decided the thing to do was to have the different units in separate boxes so that we could stow them away as we wanted to and then connect them up like this. Then the aviators said they wanted all the apparatus in one box, and the result was the next set developed was this set known as the 68 type, in which the transmitting and receiving units are in the same box. You have dispensed with all cords excepting to the telephones on your head and to the power supply where the current is fed into the apparatus. An interesting part is that after we had made large quantities of this type of apparatus, and after coming along to the summer of 1918, we again reverted to the general type of apparatus which was shown in the first picture.

This is the interior of that same 68 type set, and shows how compactly the apparatus had to be arranged. Here are the tubes which produce the high frequency energy and show the mixing device, for mixing the high and low frequency current through these three tubes. Here are the amplifier tubes, used with the receiving apparatus, and in order to conserve space, the transmitting tubes are mounted inside of the antennae coils. Normally that apparatus is in the receiving position and the operator is always able to hear what is going on. If he wants to talk he presses a button and the thing is automatically thrown over from the receiving to the transmitting position. Oddly enough, in connection with this whole radio telephone work, the problem was not one of radio work at all. The two big problems which had to be solved were, first, production of sources of current to operate the set, and, second, the noise problem.

This is a picture of the final form of power supply for current to operate the radio telephone sets. It is a wind-driven generator, mounted on the landing struts in the stream line under the fusilage. The generator is in a stream line case, and the whole thing is driven by this little propellor at the front of the machine. The reason that that problem was difficult was this. To operate successfully the radio telephone set of the type I have shown you, it is necessary that you have a practically constant source of current. It must not vary, otherwise the efficiency of the set varies tremendously. When we started out, the instructions given to us were that we were to use the generator connected to the prime mover of the airplane. It didn't look good to us, but those were the orders. Very shortly the aviators themselves kicked over that; and didn't want to have anything of that sort connected with their prime movers. The next plan was to use storage batteries, but they were cumbersome and difficult to maintain, and were given up. Finally we came to this wind-driven generator type. The problem there was to produce a constant—we had two voltages, high and low, and it had to be constant for any condition of operation of the airplane. They told us the apparatus must work either when the plane was climbing at its maximum angle, or when it was doing a nose dive. We found that the wind-driven generator operated anywhere from 4,000 to 14,000 revolutions per minute, yet the voltage had to be held constant within about five per cent. Here again our friend the vacuum tube came to our assistance, as you will see in the next two pictures.

Here is a picture of this same wind-driven generator, and shows the vacuum tube in the tail of the apparatus. We made no attempt to govern the speed of the machine itself. We governed the whole thing electrically.

This down here represents the vacuum tube, which in this case is merely a filament and plate. These are the two generator windings, high and low voltage, and these are the field windings on the direct current generator. One of these is connected around through the filament, and the other around to the plate, and has the evacuated space as part of its circuit. If the machine starts to speed up, more current flows in here and gives off some of these little carriers and enables more of the current to flow around this circuit, and if these two windings are placed in position, you get practically a constant field of excitation, with the result that you get practically a constant voltage characteristic similar to this, which, as you see, is between 5,000 and 14,000 revolutions per minute—practically a straight line characteristic.

This picture of a complete outfit for a two-place machine, the aviator and the observer each being equipped with a radio telephone, each being able to operate, listen, or talk, and being able to use the same transmitters or receivers to communicate with each other. One of the by-products that we got was a fine intercommunicating system for the planes. Here is the wind-driven generator, the receiving set, the intercommunicating box here, the transmitter there, and the other one here.

This is a picture of a ground set which was used as a part of this whole airplane business. The apparatus is quite similar to that used in the airplanes themselves, but somewhat larger, the power board on the left there and the transmitter and receiver mounted on it, with long cords so that the man using the set could be a hundred feet away from the set out on the field and still operate the set. One of the most valuable uses of this device was in the training of the aviator at the time he began to do solo flying. They would send a man up, giving him directions with a receiving set on his head, and put him through a course of sprouts up in the air, with the instructor standing on the ground.

This is the interior of that same ground set, showing the transmitting tubes at the right and the receiving tubes here, and the various air condensers and the coils required and distant control apparatus. I should say that this set, which is the ground set, was probably 30 inches long and about 24 inches wide, and maybe 8 or 9 inches thick. The airplane set is considerably smaller and weighs but a few pounds.

This is a picture of the transmitter used, one of the forms of transmitter used for talking and the receiver which is employed, one of the forms of receiver employed by the aviator. This was the other big problem which had to be solved. In the first place you had to get a receiver through which you could hear this radio talk and which would at the same time cut out the noise from the engine. That problem was solved without making any particular change in the type of receiver used. It was essentially the watchcase type of receiver. It was a problem of acoustical shielding. This transmitter had to be operated effectively by the voice of the observer talking in a low tone and at the same time shut out disturbances due to the unmuffled exhaust of the engine. The problem was solved by shielding the diaphragm of the transmitter with a very thick shield through which a few pin holes were punched. The result was that when you talked directly at the instrument, the instrument was actuated, but if the sound came from even a slight angle, it never got into the diaphragm. The result was that you could talk perfectly into this transmitter in a place where you absolutely could not hear yourself shout, and yet you would hear none of the noise which made it impossible for you to hear if you didn't listen through a receiver of this general type.

This is simply a picture of a two-place machine, with the two men equipped with transmitters and receivers, either one of them being able to use the wireless apparatus, or if they wanted, to communicate one to the other, by moving a switch, using it then as an intercommunicating system, a wire telephone.

This is the final form of apparatus devised but never used in any considerable quantities, known as the short wave length set, in which the transmitting units were mounted in one box, and the receiving units in another, and the intercommunication apparatus in a third box, and the whole thing connected together with cords—a reversion to type. This apparatus had a wave length of only about 75 meters. It enabled you to use antennae which were built onto the planes instead of on the controlling wires, and the whole thing only weighed about 25 or 30 pounds. This box was a cube, 13 by 14 inches, and this one about 11, and this one 11 by 6 inches.

This is the interior of the transmitting set, and shows how compactly the apparatus was mounted together. The same general type of vacuum tube was employed there.

The next one, I think, is another picture of the receiving set, and simply shows again how compactly the things had to be mounted, and the general type of tube used. This vacuum tube had to be manufactured in large quantities, and turned out on punch presses. This plate here—you can see it in this picture—is stamped out on a punch press and made out of nickel or iron and cleaned up and put in there and evacuated.

This picture is a schematic presentation of the type of apparatus used on submarine chasers, and mounted as it was on the chasers, but on a board so you can see all parts of the apparatus;

the power panel at the left using motor generators supplied by the regular sources of supply on the boat. The combined transmitting and receiving unit is practically the same as the ground sets shown a few minutes ago, the only difference being that here is one of those three-stage amplifiers put in so that instead of receiving on a pair of head telephones you receive from a loud speaking receiver which you can hear all over the boat. Normally it is in the receiving position, but can be automatically switched over if desired.

These next two or three pictures are simply thrown on to indicate what the manufacturing problem was. This is just one corner of the assembling room in which the interior parts of the transmitting tubes alone were gotten together. These girls are simply assembling the filaments and grids and plates together, to be put into the tubes to be evacuated. At the time we were turning out 9,000 or 10,000 a week of these tubes. I presume there were 500 of these girls employed in assembling processes, and those processes six months before were research laboratory types of problems.

This is one of the evacuating benches where the tubes have the air taken out of them, the air and gas. The tubes are sealed onto pumps, which are mercury aspirator pumps, and are heated up in ovens and evacuated while still hot to a very high degree of vacuum. In the process large quantities of liquid air are used to get out any moisture or gases that might come back from the pumps. I think that something like 300 quarts of liquid air a day were used in the evacuating process. We kept two liquid air plants going all the time.

Now we come to another phase of the work, the submarine-detecting problem. When we started into the war, we knew practically nothing about the problem of submarine detecting. No one knew much about it. A submarine at that time, if it once submerged, was practically safe. The first real progress was made at Nahant in the summer of 1917 by two engineers from the General Electric Company, who made use of the principle which the French employed for locating mining operations, known as the binaural principle; that is the principle by which you and I determine the direction from which a sound comes. Having two ears, we determine automatically the direction of the source of the sound. These men took a couple of acoustical detectors shown here at the bottom of the picture, mounted them on a bar connected with a vertical bar which went up to the side of the vessel and had a tube leading from each one of these detectors up to an ordinary stethoscopic receiver. In effect they put their ears three or four feet apart, under water. If a vessel produces a disturbance about over here, he drops this apparatus in the water in haphazard fashion, and listens on this stethoscope up here. The thing might appear off in any direction, right or left, but if you rotate this device around a vertical axis by means of that handle up there, the sound appears to travel around through your head to the left and at some point it appears to be directly ahead of you. When that condition is reached, it means that the source of sound is at right angles to that horizontal bar.

As soon as that was developed and shown to be satisfactory, we had the first real means of accurately locating the direction of the disturbance produced by a submarine, and it was that type of apparatus which was first put in service on the small subchasers. The reason that you had to have a fleet of chasers was that this thing did not do any more than give you the direction. You had to have two or more observers for the same source of sound to know where the disturbance was. Mostly these chasers worked in fleets of from three to seven vessels and you needed to have instantaneous means of communication between the vessels so you could get a proper location of the thing you were looking for. The device, while it was very satisfactory in some ways and a very great advance over anything that had been done, had very serious limitations. In the first place it could not be used when the boat was in motion nor on large vessels, so that it had a limited field of application. The first improvement in the device that was made followed the suggestion of Professor Mason of the University of Wisconsin, who, instead of turning the whole apparatus, had his acoustical detectors fixed, and by means of a slide trombone affair adjusted the length of the air tap so that when he increased the length of the air path he automatically shortened and produced that same disturbance produced by turning the whole apparatus. He had a properly calibrated scale and could tell when he got the sound directly in front of him, just what the direction of that sound was with reference to the course of the vessel. But it could not be used on a moving vessel. Time is too limited to go into the details of all the improvements. I am just going to hit one or two of the high spots.

The apparatus in this picture shows an adaptation of that last form of apparatus to harbor protection. We employed it in this country at quite a number of harbors. Those acoustical detectors were supplanted by electrical detectors mounted on tripods connected up to shore by electric cables and which are transformed into sound compensated by a compensator and observed through a pair of receivers. If you mounted two of these detectors on two legs of the tripod you got a certain fix on this disturbed source. If you had three of them on there, absolutely simultaneously or in rapid sequence, you got it bi-directionally. If you had simultaneous listening on two or more tripods, you could get an absolute fix on the location of that disturbed sound, provided you knew where these tripods were and how they were variant.

This picture is one taken of one of those tripods being lowered in Chesapeake Bay, and gives you some idea of the size of the apparatus. My recollection is that they were about six feet high and about twenty feet between . . . Two electrical detectors here, and this box in the center is a switching device which enables you to put on a pair of electrical detectors and make connection with a cable going to shore by pressing a key. The principal problem connected with this general problem was not an electrical one so much as it was a problem of making the stuff strong enough and making it water tight.

This is a picture of two of the types of electrical detectors used on those tripods. The small one to the left is the type used on all this harbor protection along this coast in water up to 100 fathoms or so. This one was developed for use in the Straits of Otranto, where the water is 600 fathoms deep. It was never put into service because we never got far enough with the thing before the armistice was signed, but it had to operate in 600 fathoms of water to be a proper detector and withstand the heavy water pressure.

This is merely a picture of that selecting mechanism, mounted on a box with a tripod, and water tight. It was nothing but an ordinary alternating current selector, such as used on train-dispatching circuits, enabling you to pick out instantaneously any particular pair of detectors on any group of tripods that you wanted.

This shows some of the difficulties encountered in this general type of work. One of the first difficulties was in this marine work, making things strong enough; but after you have solved that problem, you still have the sea and its myriads of animal life. This thing with the Santa Claus whiskers on it is one of these detectors that had been down a few months, and, oddly enough, the thing still worked.

This is simply a nearer view of some of the detectors, showing the amount of growth and corrosion on them.

A few minutes ago I showed you a picture of Professor Mason's first improvement, where he used two detectors and the slide trombone affair. Professor Mason was also responsible for further developing that general idea, and so was undoubtedly responsible for the best form of submarine detector which has been invented, and which can be employed on large vessels and built into the vessels and employed on them when going at high speed and without having to turn the vessels. He used a large number of detectors placed in a line on either side of the vessel, all properly connected together. In his original form all acoustical detectors were properly connected together through compensating pipes so that they could be brought up to the ears through a compensating device. In the elaborate form of apparatus finally developed and manufactured, instead of having the slide trombone affair, he had two sliding plates, one with a groove in it and the other with a couple of little bars which fitted into those grooves. These grooves had four ports, two from the receiving apparatus and two leading out to the stethoscopic receiver, and as you revolve one plate with respect to the other, you lengthen or shorten the path through these grooves and so produce this compensating effect, a very great improvement over anything which had been done up to that time and was installed on a considerable number of quite large vessels.

The next improvement was to substitute electrical detectors and electrical compensating systems for the purely acoustical one. The acoustical one had quite serious limitations due to the fact that you had no means of amplifying the sound. You had to have your observer relatively close to the place where you had your detectors located, and you had to very carefully shield the pipes leading to the observer's ears from the noises produced by the ship itself. With the electrical system, if you employed microphones in place of acoustical detectors and an electrical compensating system was installed, you could employ amplifying devices between the detector and the observer, and you could have twelve observers listening and located anywhere you wanted on the ship. That is the most modern form of the apparatus to-day, as it stood at the time the armistice was signed. That type of apparatus was installed on one of the transports, the *Von Steuben;* and after the armistice was signed, a number of experiments were made, and I believe that in one case while steaming at seventeen knots speed, she picked up the Nantucket Shoals lightship bell at a distance of forty miles in a relatively rough sea, with an actual pointing of about four or five degrees. This indicates how accurate and sensitive the apparatus is.

This picture shows one of the compensator tables. The compensator is arranged so that two observers can listen. This happens to be an acoustical compensator, with the stethoscope ear pieces we saw before.

The next one or two pictures show forms of electrical compensators of artificial lines mounted in these boxes. The stethoscopic receivers are supplanted by ordinary watch case receivers, and the whole thing is operated very simply by a little dial. The apparatus itself, however, is quite complicated inside, due to the fact that if you have twenty-five to thirty receivers on the side of the ship, you have to have twenty-five or thirty artificial lines, each one of which, when you turn the handle over, is increased in the same amount as every one there, or decreased in the same amount as every other one on the other side of the boat.

This is another view of one of the electrical compensators for twelve detectors on either side of the boat. The detectors are mounted either inside of the vessel or inside of the blister and led up through a compensating device to ear pieces.

This is simply the internal workings of that same electrical compensator, and shows how complex the thing is, inside. A hand wheel makes and breaks all of these multiple contacts without producing clicks in the ear or any sound, the whole effect being merely to make this sound to shift back and forth through your head until it appears to be directly in front of you.

Now, the sound ranging. In locating the position of a distant source of sound by this method, what you do in effect is to measure the time of the arrival of that sound at definitely located points, three or more points. If you can measure the time of the sound accurately, it will give you the proper corrections and an exact fix on the location of that source of sound. Of course, if the wind is blowing, if the contour of the land is rough, you have to apply certain corrections, but the accuracy of the observations, with proper apparatus properly employed, is very startlingly great. The receiving apparatus, usually indicating at the plotting station, is usually located quite a good many miles from the front line where the detectors are located. The detectors, microphones or electrical detectors, are actuated by sound impulses, and their records are carried over the wires to the recording station where they are recorded on what are essentially records of spots of light on a moving film, what we call an oscillograph. In these cases six of those little carriers connect those stations, and in this particular case the source of sound was equally distant from all six of the detectors. This was a second from one line to the other. When that sound reached these detectors it affected all six of them exactly simultaneously. If they had not been all equally distant from the source of sound, these things would have been displaced with regard to one another, and if you knew the distance in time and knew the distance in place of the detectors you could locate the source of this sound.

Further than that, as the apparatus finally developed, the peculiar shape of this record told you pretty accurately what kind of a gun it was that was fired, whether a small calibre or short gun, short howitzer or long rifle. You could pick out of the mass of stuff you got, the gun you wanted and tell what kind of a gun it was.

The accuracy of the thing in some of the preliminary tests down off Sandy Hook, with the detecting apparatus located five or six miles away from the gun that was firing, the accuracy of location showed the position of the gun to be within about twenty yards of its actual position.

They tell us a rather amusing tale of the British using this apparatus, of a big German gun firing on Dunkirk, causing trouble. They made the location by sound-ranging methods, and had a battleship throw a couple of shells into the position they located. They never heard from the German gun afterwards, and kicked themselves for firing more than one shot.

This type of detector was used close to the front lines, at unattended stations, and was just a gasoline can with the detector mounted on top of it. They placed these out at night or in foggy weather and never had anybody around.

This is an outside picture of the recording mechanism, which might be five or six miles away from those detectors, and toward which all lines converge. There are little mirrors and a revolving film in this apparatus, and it records one spot of light for each detector, the whole thing developed automatically in a tank here to the right, so that within a few seconds from the time the observation is taken, the man at the plotting board has his record from which he locates the position of the gun and gives it to the man at the artillery emplacement.

This is a switchboard used in connection with two of these detectors. The lines have to be kept continually under test, and if the lines are out, or the detector destroyed, you have to have rapid means of throwing in new detectors and have them properly adjusted, so that the record goes on continuously. It is a rather elaborate piece of apparatus, but essentially of ordinary telephone construction. These were usually mounted in dugouts, and all of them provided in internal make-up with compartments in which were detonating charges, so if you had to fall back, the whole thing could be destroyed and not fall into the hands of the enemy.

The last thing which I am going to show you is quite a different type of detecting apparatus, but in employing that same bidirectional principle so productive in submarine detection. This is a case of airplane detection for use on anti-aircraft guns. In the airplane problem, as distinct from the submarine detecting problem, there are two factors which were very baffling. In the first place, sound travels relatively slowly through the air, and in the second place the airplane travels very fast through the air, so that whether you are listening by a detecting device on the ground or by your ears, you are never listening to the sound of the airplane at the point where you happen to see it, but you are listening to the sound produced at some interval of time before. The result is we have to devise some system by which you could get these results simultaneously; with proper compensation for the position of the stations and the conditions of the atmosphere you could predict where the airplanes would be at a given instant, provided they did not change their course or speed.

The form of detecting apparatus ultimately developed for any one of the listening stations, is this one, where there are two horns or parabolic mirrors mounted for azimuth determination and altitude determination, and an observer at each. You will see this observer gets his sound into his right ear from this tube, and the sound in his left ear from this tube here. All a man has to do is to keep the horns pointed in the direction of the airplane—simply swing this around. This man does the same thing with regard to altitude. There are two or three more of these stations, located a number of miles apart, and the whole system of stations is connected to a central observing point by means of wires and an arrangement of synchronous motors, so that the recording apparatus at the receiving station moves in synchronism with the movements of these horns.

These observers keep the horns pointed right, and at the receiving station the results of those movements are plotted automatically. What you have to do, to get an instantaneous observation, is to have the record from two or more of these stations simultaneously recorded.

We started in with some sort of mechanical pointers which moved around as these horns were moved, but we got into difficulty, due to the fact that you were trying to have two things occupy the same space at the same time. The final solution was quite ingenious.

This represents one of the recording stations, here shown as arranged for two observing stations, each with an altitude and an azimuth observer. The plate at the top is a big piece of plate glass. These are synchronous motors, moving in synchronism. Two horns at one observation station. It is the same thing on the other side. These little things here are a pair of periscope affairs with an incandescent light in the bottom and a prism at the top. The result is that the light from that mirror goes up through that vertical tube and the prism of light shoots it up to the bottom of the plate glass. As the motor moves, this tube turns on a vertical axis, and this beam of light sweeps around on the bottom of the plate glass. The observer, looking down, sees as many beams of light as there are tubes in operation. When the field observers have the horns pointed at an airplane, these beams of light all converge to a very small point, which is the position of the airplane at some predetermined time, and if he has a map on the table and proper correction tables, he is able within a very few seconds, by simply working at those tables, to say where the airplane will be at a given instant, provided it does not change its speed or direction.

It was estimated that with reasonable wind conditions, it would be possible, with this apparatus properly handled, to have the first discharge from an anti-aircraft battery fired at an unseen airplane, exploded in a sphere one-eighth of a mile in diameter, in which the airplane is contained, which is quite a good deal more accuracy than is possible by simply shooting into space.

This is a near-up view of the same thing. This is quite a large piece of apparatus, as I remember about six or eight feet high. Here are the two periscope tubes, which can be mounted close together and so produce beams of light from the same point.

This is the last picture which I have to show you. It is merely another form of ranging apparatus for determining gun fire, not by sound, but by simply observing the flash of the firing of the gun through a transit which is connected by synchronous apparatus to an observation table through a switchboard of this general type.

I am afraid I have tried to cover too much ground to be very clear to you, but I will be glad to answer any questions and I hope I have not taken too long.

Mr. Ford: During the many years I have enjoyed membership in this Society, I do not recall a lecture which has been delivered in a more straightforward and convincing manner. I congratulate the Society in securing Dr. Jewett for this afternoon. After listening to his lecture, I feel convinced that not all the brains in this country are in the Army and Navy. It was because our Government could call into service at short notice, during the great crisis, a vast army of engineers from civilian life, that this country was a contributing factor and perhaps the deciding factor in winning the war. I move a rising vote of thanks for Dr. Jewett's wonderful lecture.

(Rising vote of thanks.)

STEVENSON DAM, HOUSATONIC RIVER, CONN.

By H. J. Hoard, Engineer in Charge.

Mr. President and Gentlemen:

Unfortunately when you were at Stevenson last summer, I was called away for the day, leaving just before you got there and returning shortly after you left, so I did not have the pleasure of meeting you. My talk on Stevenson this morning will be just a little story for you, illustrated with pictures dating back to the beginning of the work and carrying it through to the present time.

The job is not quite completed, although the plant is running and producing power.

The Stevenson development is located on the Housatonic River, almost six miles above Derby, and is immediately above the pool of the Ousatonic Water Company of Derby. It is planned to have the Stevenson tail water at the level of the Derby pool, thereby utilizing the complete available head between the two pools.

The development consists of four principal divisions, first, the power house, second, the spillway section of the dam, third, the intake immediately above the power house and adjacent thereto, and fourth, the end abutments of the dam. The power house was originally located on the left bank of the river, but subsequent investigation proved that by constructing it on the right bank, considerable time could be saved and about 18,000 cubic yards of rock excavation avoided, so the change was made.

The river basin is about 1,500 feet wide at the dam site and the river channel proper about 200 feet.

The whole structure is founded on Connecticut gneiss, a very hard rock, free from fissures and seams and exceptionally tight, there being practically no water-bearing seams. The bed rock was encountered at depths below the natural surface, varying from 20 feet to a maximum of approximately 65 feet. The over-

WORK IN PROGRESS.

burden was composed of sand, gravel and boulders, and for such material the banks of our open cut excavations stood at wonderfully steep angles.

The excavation for the dam for the sections extending from the right shore line back for a distance of 90 feet was accomplished by the use of internally braced steel sheet piling enclosures thirty feet long and the full width of the dam, or 81 feet. These enclosures were driven to bed rock and made a very satisfactory way of getting in that part of the dam adjacent to the river where the gravel overburden was from 50 to 60 feet deep and the ground water considerable. The interior bracing was put in as the excavation proceeded and was removed as the concrete work was carried up. The balance of the excavation was carried on open cut and no sheet piling was used except in a few isolated cases where the banks would not stand up well.

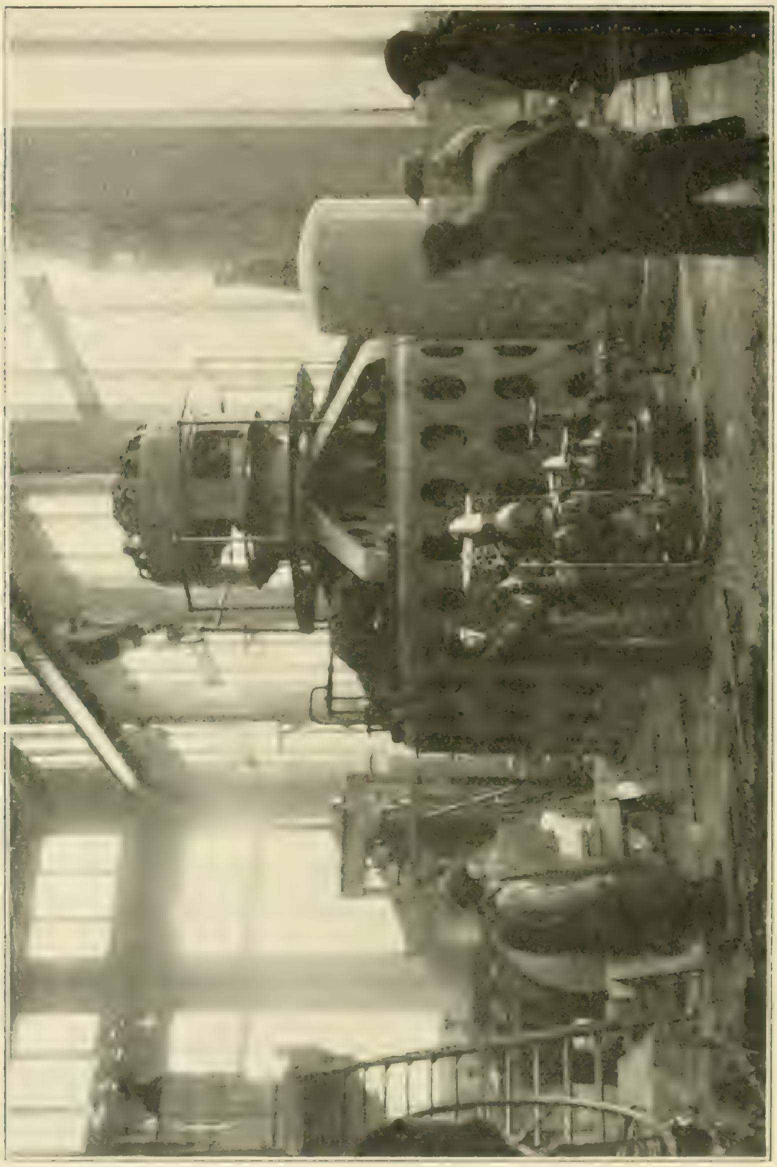
The excavation within the enclosures was made by clam shell buckets operated by derricks. The open cut excavation was principally done by steam shovels and partly by means of a drag line outfit and by hand labor.

The water encountered in the excavation was handled by 6-inch and 8-inch steam pumps and 8-inch electric driven centrifugal pumps. Small steam siphons were used in handling small quantities of water from certain points in the excavation to the main pumps. In so far as practical, the water way led to centralized pumps either by means of pipes built into the concrete or by natural drainage courses, reducing the number of pump changes to an absolute minimum. In all we had twenty-five pumps in operation handling water from the excavations.

Work progressed simultaneously on both sides of the river, that on the left bank forging ahead to completion before that on the right bank. This fact made it possible to see the full section of spillway portion of the dam, a sight seldom seen in dam construction.

The dam is surmounted by a reinforced concrete highway bridge carried on piers on 30′–0″ centers. This bridge has a 23′–0″ clear roadway of crushed rock, macadam, tar bound, and was built to replace the old Zoar Bridge which formerly spanned the river about three quarters of a mile above the new dam.

The means of handling the river during construction might



GENERATOR.

interest you so I will give a brief description of how it was done. The work was carried on on both sides of the natural river channel without interfering with its flow and on the right bank, a diversion channel was excavated 90 feet wide with the bottom elevation at +20 or 12 feet lower than the natural river level at the dam. Six openings each 10′ x 15′ were left through the constructed portion of the dam. When it came time to turn the river from its natural channel into the diversion channel, a cofferdam was put across the river just below the entrance to the diversion channel and the river forced to flow through its new channel. A cofferdam below the dam kept the river from entering the excavation from the downstream side.

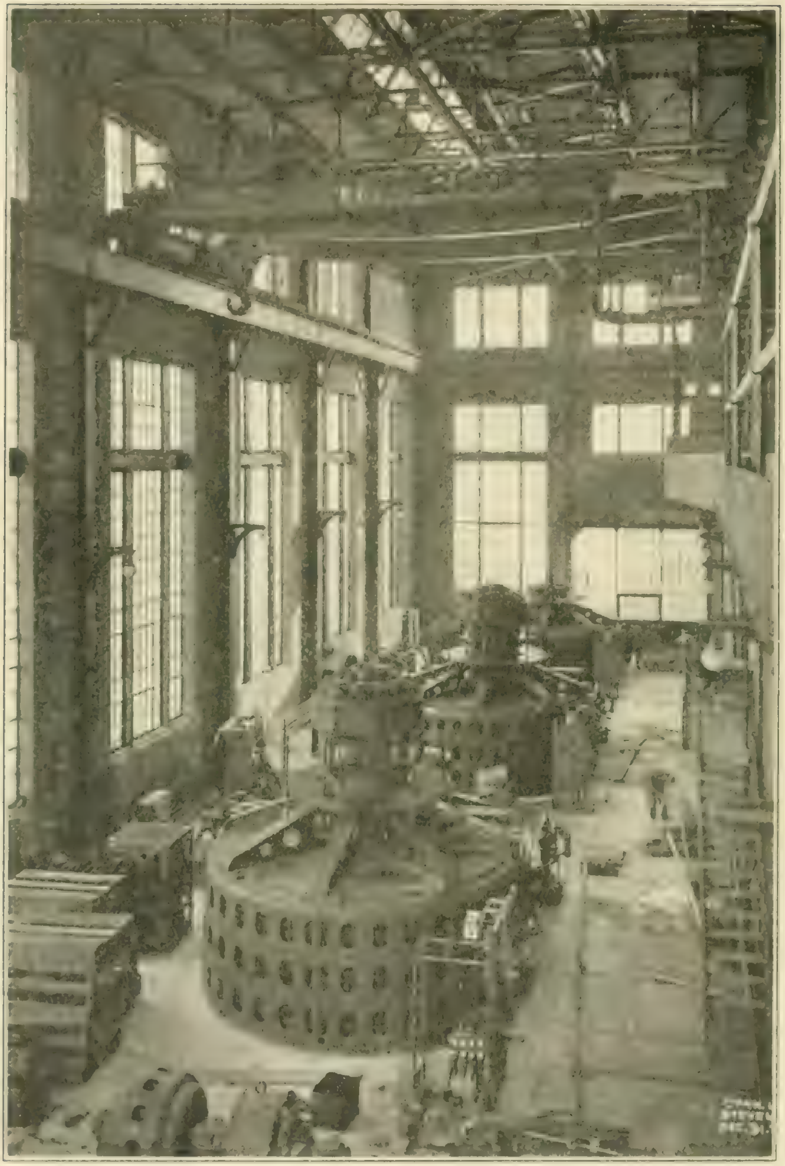
The deepest part of the excavation proved to be near the left bank of the original river channel. Here we were compelled to go about 65 feet below ordinary water level for bed rock or to — 25 feet elevation. This is about 25 feet below mean tide water elevation.

From the deepest part of the excavation to the crest of the dam, it is about 125 feet, and to the top of the bridge balustrade about 150 feet. The length of the completed structure is about 1,300 feet or nearly one-quarter of a mile.

The power house is of concrete with a steel and brick superstructure. The roof is of gypsum slabs, covered with 5 ply Barrett specification roofing. The building is 160 feet long by 80 feet wide and is about 135 feet high from bed rock to roof.

The ultimate development calls for four 10,000 H. P. units, three of which are installed at present. Each water wheel is supplied with water through its own individual penstock and scroll case built of reinforced concrete. The curved draft tubes of the units are also of concrete and are 11′–3″ in diameter at the top and 26′ x 20′ 9″ at the outlet. The shape of the tube is changed by long gradual curves so as to form easy water passage for the discharge from the wheel.

The unit is of the so-called vertical type and is directly connected to the generator shaft by a face coupling. The generators are rated at 7,600 K. V. A. and operate at 150 R. P. M. generating 6,600 V., three phase, 60 cycle current. This is stepped up through single phase 2,500 K. V. A. transformers to 66,000 volts for transmission to the Bunker Hill Substation about twenty-five miles distant.



OVERHEAD VIEW OF GENERATORS.

Concrete aggregate for this development was obtained from a natural gravel deposit located about one-half mile upstream from the dam. This material was so well proportioned as to large and fine aggregate that we were required to but excavate it, and remove the gravel over six inches in diameter to make it suitable for use as bank run aggregate. The removal of the oversize material was accomplished by passing the gravel over a movable grizzly at the pit, the undersize passing directly into twelve yard cars and hauled to the mixing plants.

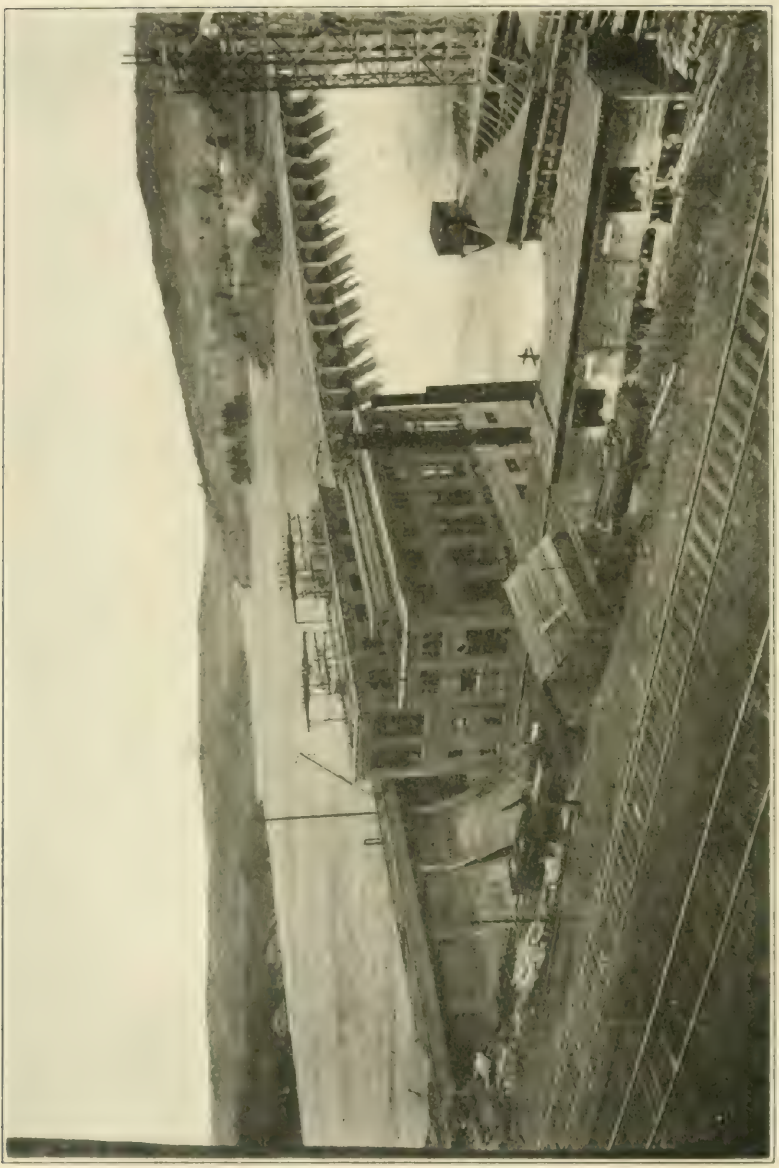
Three mixing plants were used on the job, two of which were equipped with two one-yard revolving mixers, electrically driven and a third plant equipped with one-yard Haines gravity mixers. Each plant was equipped with a double concrete elevating tower from which the concrete was chuted into the forms.

Gravel from the pit was hauled directly to the different mixing plants and dumped into the storage bins from which it was fed by gravity to measuring hoppers, the cement added and the mixture, by gravity, to the mixers. From the mixers it was chuted into the work.

Daily tests of concrete were made on 6-inch cubes, which were broken at seven and twenty-eight day periods. Six days of the week the cubes were broken in the field laboratory and on the seventh day at the Sheffield Laboratory at Yale. The results obtained at Sheffield were consistently higher than those at the field laboratory. This was probably due to the better class of testing machines used at Sheffield. Average results of tests are shown in the following table:

Mix	*Time*	*Sheffield*	*Field*
4½ bags per yd.	7 days	728 lbs. per sq. in.	587 lbs. per sq. in.
4½ bags per yd.	28 days	1,576 lbs. per sq. in.	1,171 lbs. per sq. in.
5½ bags per yd.	7 days	869 lbs. per sq. in.	770 lbs. per sq. in.
5½ bags per yd.	28 days	1,909 lbs. per sq. in.	1,292 lbs. per sq. in.
6¼ bags per yd.	7 days	1,147 lbs. per sq. in.	941 lbs. per sq. in.
6¼ bags per yd.	28 days	2,133 lbs. per sq. in.	1,555 lbs. per sq. in.

The 4½ bag mix was used in the dam, abutments and all other mass concrete. The 5½ bag mix in the top seven feet of the dam, the bridge and all thick walls. The 6¼ bag mix around the penstocks, scrolls, draft tubes and all thin walls.



VIEW UP THE RIVER.

The following quantities were involved in this development.

Excavation:	Earth	210,600 cu. yds.	
	Rock	1,200 cu. yds.	
	Total		211,800 cu. yds.
Concrete:	Mass	145,400 cu. yds.	
	Reinforced	11,200 cu. yds.	
	Total		156,600 cu. yds.
Structural Steel:			500 tons

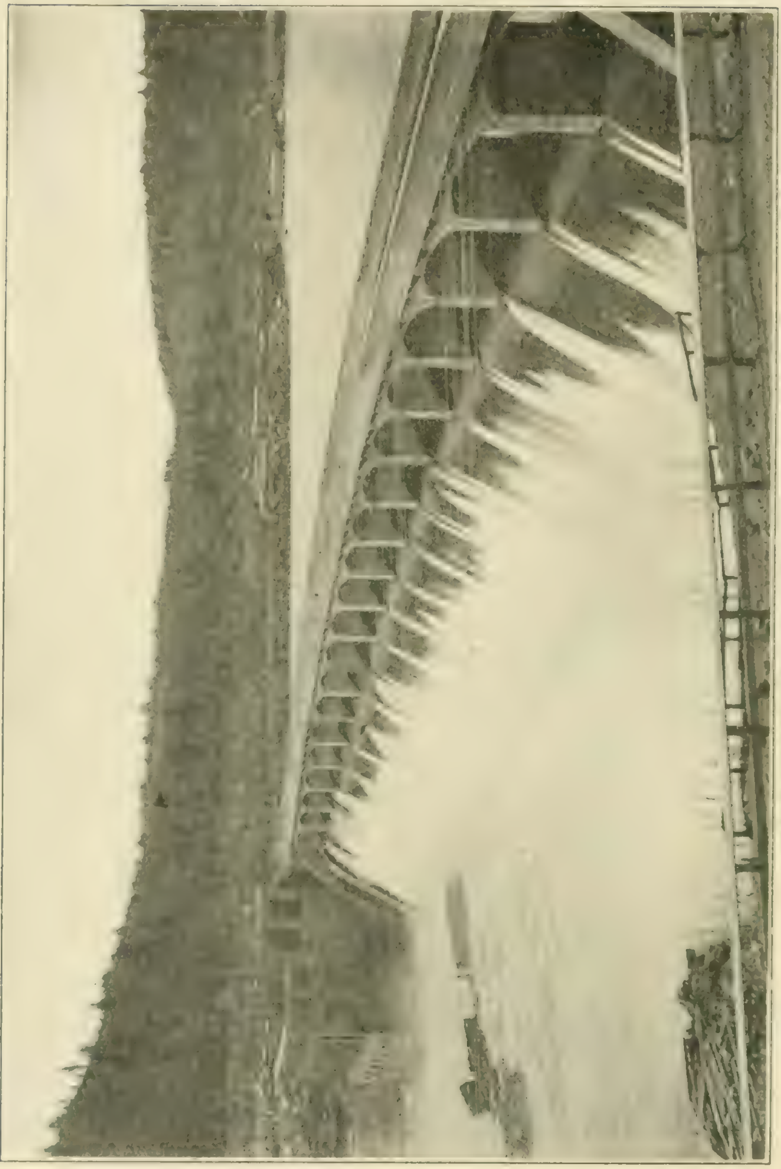
Our construction plant, other than already mentioned, consisted of a well equipped saw mill with electrically driven saws, planers, etc., a machine shop with electrically driven lathe, planer, drill press, power hack saw and power pipe threading machines, two blacksmith shops; a steam power station; an electric power station and the necessary store houses for cement and power house equipment.

Our camp was capable of housing and feeding 750 men per day, which constituted our maximum force. Two shifts were operated during the past year in order to maintain the schedule adopted January 1st, 1919, and which called for delivery of power January 1st, 1920. By hard work and good luck we were able to operate our first unit November 24, 1920, or thirty-six days ahead of the schedule.

Our maximum day's output of concrete was 1,660 cubic yards and the maximum yardage for one month was 27,000 cubic yards, placed during September, 1920.

Question from the floor. Did you anchor the dam to bed rock?

Mr. Hoard. No, sir. The surface of the bed rock was worn in sharp ridges and valleys which had a strike of 45° to the general line of the dam and formed an ideal foundation upon which to build. The forms were anchored to steel pins set in the bed rock. Every horizontal as well as vertical joint was made irregular by key boxes set in the concrete. This was done to prevent excessive leakage through these joints and resist sliding and shear. Practically no leakage occurs along any joints.



VIEW FROM EAST BANK, SHOWING CONCRETE HIGHWAY.

SOME LIMITATIONS IN THE PRECIPITATION OF TRADE WASTE WATERS

By Frank Bachmann, Chemist and Engineer, Connecticut State Department of Health.

The importance of treating trade waste waters in Connecticut before their discharge into the streams of the state is being brought home to us more and more as time goes on. Our waterways are suffering from these discharges and the effects are very apparent. Many of the streams have lost their purity years ago and are now repulsive in appearance, accompanied, in some instances, with repugnant odors. The streams vary in color from the sparkling water-white liquid of the upper mountain brooks to the black, putrid streams of the lower valleys. Many shades of color are found, depending upon the kind of waste discharged.

The manufacturers are not solely to blame for the poor condition of the streams. Sanitary sewage from the cities and towns make up a large part of the pollution. The cities and towns must bear their share of the responsibility for the existing conditions or a clean-up of the streams in this state will prove futile. The manufacturer and the community are interdependent. Both must face their responsibility with a coöperative spirit to accomplish the best results. It can be stated without reservation that this spirit prevails to-day in the relations between the state, city and manufacturer. With such an attitude prevailing, satisfactory results should be accomplished.

In its programme of a sanitary clean-up of the streams of the state, the State Department of Health is carrying on experiments with a view to the satisfactory treatment of various trade waste waters. One of the lines of attack on this problem is chemical precipitation. This form of treatment has been used on a large scale on sewage and trade wastes for many years and in a number of cases has proved successful in the solution of the problem. Many cases, however, are on record where chemical precipitation of sewage has been abandoned for one reason or another to be replaced by more recent developed processes.

Chemical precipitation appeals to the engineer, chemist, and layman probably on account of the ease with which clarification is ordinarily obtained. In the course of inspecting factories, it is not uncommon to have the representative of the plant ask, "Isn't there some chemical that can be added to the waste to purify it?" This is a fair question and must be answered with due consideration to the particular problem. Too often it is found that clarification is the result desired, the assumption being that if clarification is effected the treated waste is satisfactory from any viewpoint. This assumption is held by many technical men who have not made a particular study of the sanitary aspects of the problem. For this reason it was believed that a discussion of the limitation of chemical treatment might prove of interest.

The chemicals which are commonly used in the precipitation of sewage and trade waste are: lime, copperas, alum, soda ash, alumino-ferric, ferric sulphate, sulphuric acid and sulphur dioxide, either alone or in combination. There are other chemicals in use but those just mentioned are among the cheapest and most universally employed. The choice of chemicals or combination of same depends exclusively on the character of the waste to be treated and within certain limits upon the results desired. No two wastes even from the same kind of industry will react the same, as many factors enter into the kind and amounts of chemicals needed.

In the treatment of wastes consisting mainly of mineral matters as the objectionable ingredients, such as in pickle and plating wash waters, chemical treatment is usually successful. Treatment of these wastes with lime or soda ash to neutralize the acid and precipitate iron and copper is satisfactory. Where, however, the waste contains organic matter, the problem of obtaining a satisfactory effluent becomes quite difficult. Wastes of the latter type will be here considered.

Organic matter in sewage and trade wastes is present in three ways, namely: in solution; in colloidal form, that is in the emulsified state; and in the suspended state. When chemicals are added to waste waters, the resulting precipitates envelop the suspended and colloidal matters and precipitate part of the soluble organic matters, which are subsequently removed from the liquid by plain subsidence. The improvement effected, aside from the physical, depends upon the amount of the putrescible matter remaining in the treated liquid. Recording the removal by the treatment on the percentage basis does not show the real condition of the effluent. For instance a waste containing 200 parts per million of organic matter when treated may show 40 parts. A percentage removal of 80% is noted, which is ordinarily considered very good. Such an effluent is still of an objectionable character on account of its residual putrescible organic matter. Where adequate dilution is available, however, the discharge of an effluent of this character may not be objectionable.

Available dilution is not always the controlling factor in determining the acceptability of the treated waste. Many cases have been recorded where adequate dilution to prevent odor nuisance was available and where other phases of the problem had to be considered, such as complaints arising from plant growths. One instance in particular of this kind comes to mind where a town filed application in the courts for an injunction against a paper mill to discontinue discharge of sulphite waste liquors into a stream. The town obtains its water supply from this stream by diverting the water into reservoirs and chlorinating it before use. The mill is located about fifteen miles above the point of diversion. The stream is very rapid and the flow so large as compared to the volume of sulphite waste as to make the latter appear to be insignificant. Dissolved oxygen was always present to practically saturation below the mill and odors were absent. Chemical analysis indicated a very slight increase in the nitrogen content and the oxygen consumed by permanganate was increased about thirteen parts per million by the mill discharges.

The organic matter represented by the oxygen consumed served as food supply for a bacterium known as Sphaerotilus which grew in the stream in long filament some three feet in length. These filaments gave the water a dark appearance. They loosened from the rocks and settled in the town reservoirs and during the warm months of the year decomposed, imparting disagreeable tastes and odors to the water supply. Other objections to these growths were the clogging of water turbines and pipelines which was quite annoying to the several power plants on the stream and the killing of fish by suffocation due to the plant growths lodging in their gills.

This instance is pointed out as typical of what may occur in other streams where the degree of treatment is based exclusively upon the dilution available to prevent other nuisances. Other organisms besides the one mentioned above are responsible for complaints. Each waste needs special consideration taking into account its character and the treatment necessary to eliminate certain objectionable conditions. Generally it may be said that trade wastes do more injury to a stream than an equivalent of domestic sewage based on the quantity of organic matter in each.

In the chemical treatment of sewage, removal of 90% of suspended matter, 50% of organic matter and 90% of the bacteria is about the average. The effluent while practically clear and all that is desired from the physical standpoint is unstable as the putrescible matter in solution has not been entirely removed. Experiments with chemical precipitation at Milwaukee with sewage consisting of 23% industrial waste, including waste from breweries, tanneries, and packing houses, gave a reduction of 71.2% of suspended matter; 25.3% organic nitrogen; 44.5% oxygen consumed; and 29.1% of the bacteria. The effluent, judged from its organic constituents in solution, was much stronger than in average crude domestic sewage. Similarly, chemical precipitation on the stockyards sewage at Chicago gave reduction of 74% suspended matter; 38% organic nitrogen; 50% oxygen consumed; and 33% of dissolved oxygen demand. In order to appreciate the efficiency of this treatment, the results may be compared with those of an average domestic sewage. The comparison shows that the effluent is about three times as strong as ordinary sewage using the organic matter and the dissolved oxygen demand as a basis for comparison. These results would indicate that even though fair clarification was obtained, an effluent with a comparatively low stability resulted.

Recently the State Department of Health has carried on experiments on silk mill and other textile wastes. Silk mill wastes are very interesting on account of their complexity in composition. The character of the combined silk wastes change very rapidly throughout the day. Color and other changes are very marked. Briefly, the waste consists of silk gum (Serecin), soap, dextrin, spent dyes, etc., mixed with about 10% domestic sewage. Chemical precipitation was tried on this waste but without promising results. Varying quantities of lime, lime and alum, and lime and copperas were added in amounts which were prohibited on a practical scale as regard to cost. Clarification was obtained in some cases even to the extent of a water-white effluent. The removal of organic matter, however, was far from satisfactory from the sanitary standpoint. By the best chemical treatment a reduction of 60% of the oxygen consumed and 50% of the organic nitrogen was effected. The remaining organic compounds were putrescible and were present in amounts corresponding to crude sewage as based on the organic nitrogen and from 50 to 100% stronger than crude sewage judged from the residual oxygen consumed.

Operation in silk mills is such that any uniformity in the character of the waste throughout the day is hopeless. Vats of spent dye and other wastes are dumped when most convenient in the plant. Due to the large volumes of water used in such mills, any method of storage of certain objectionable wastes would only complicate the problem as floor and ground space are usually at a premium. In small mills this procedure may be practicable but even here it would prove costly. On account of the variable character of the waste, chemical precipitation is extremely difficult. Chemical doses for one time of the day may be inadequate or more than sufficient at another time. In the first instance poor results are expected, while in the latter chemicals are wasted. If the best results are to be maintained a maximum dosage must be applied at all times even though chemicals are wasted. The variables, volumes of waste, character and dosage of chemicals, complicate the treatment of silk and other textile mill waste waters.

Other objectionable features to chemical precipitation of trade wastes are the high cost of the treatment and the costly and troublesome problem of sludge disposal. These objections are often compensated in part or entirely by values in the sludge which are recoverable. Too much weight is often placed on this phase of the problem and disappointment results if the plant does not show a profit. In considering returns on the investment, the cost of treatment must be considered and legitimately charged to the operating cost of production.

In conclusion, it might be stated that chemical precipitation has its place in the treatment of trade waste waters either in itself or as an adjunct to other forms of treatment. Chemical precipitation is likely to be a failure where considerable putrescible organic matter is in solution and where a fair degree of stability is desired. If it has been made clear that the degree of purity can not be judged by the clarification effected, this paper will have served its purpose.

Last March the following came from Boston without name of sender, publication or date of publication. Later it was found to be an actual occurrence, located in Haverhill, Mass.

A CROSS MATCHED PAIR.

She was a maid of attractive mold,
He was a grad. from Brown;
She had a job in a shoemaking shop.
He was building a road in her town.
She passed him often at morn and night,
Walking her day's half-mile;
And he—well, the girl looked good to him,
And soon, when they met, they'd smile.

And shortly they walked out on fine summer nights,
And talked, as the like of them do;
He told many secrets, and she did the same,
Till each one the other one knew.
She was making good pay by the week in the shop.
"Forty-eight per," she said, with a laugh;
And he, well, he said: "I work for the State;
They pay me sixteen and a half!"

And did they get married? They did, they did!
It was almost a touch and a go;
But they soon found that some one must stick around
And slick up the bungalow.
So they settled like this: and wisely, too,
(For she was a sensible spouse)
The girl, she stuck to the shoe-shop job;
And the engineer, he kept house.

—*J. H. Taylor, Boston.*

BRIDGEPORT'S IMPROVED SEWERAGE SYSTEM.

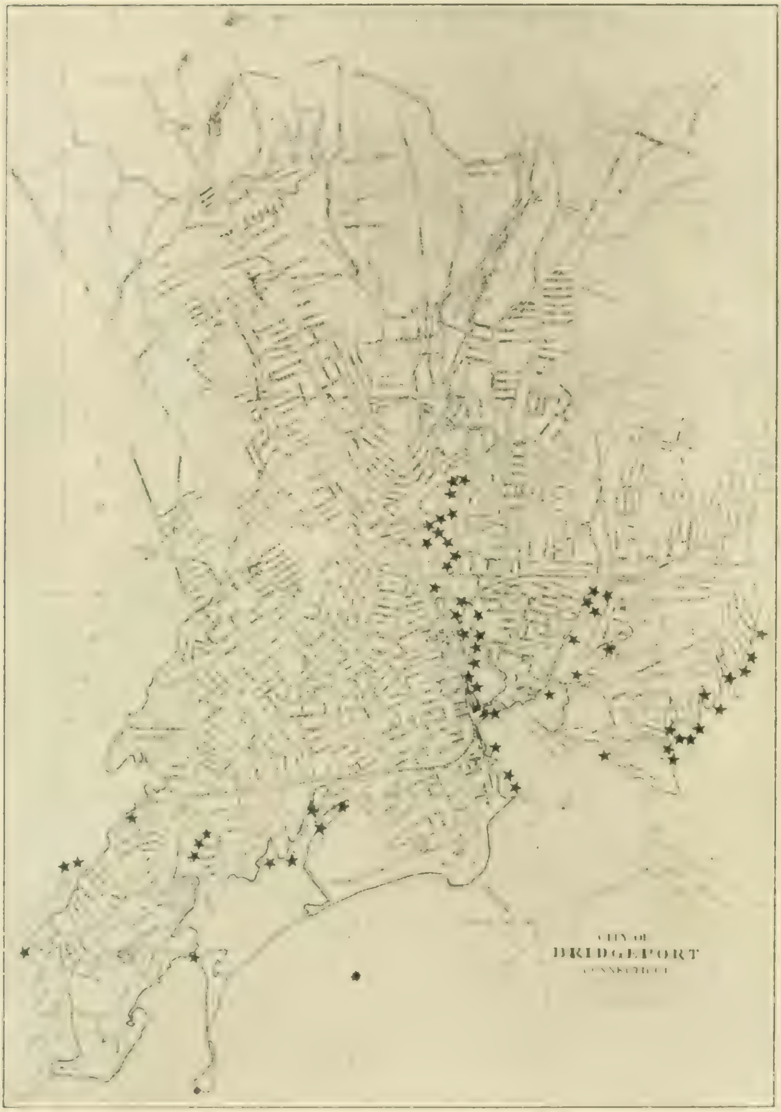
By James A. McElroy, City Engineer, Bridgeport, Conn.

In 1906 the Common Council of the City of Bridgeport authorized the mayor to appoint a special commission to investigate the existing sewer conditions and formulate, if possible, a new sewer system to meet the present and future needs of the City. The well known firm of Hering & Fuller was secured by the commission, and their report, submitted in the spring of 1908, has served as a guide for all sewers built since that time.

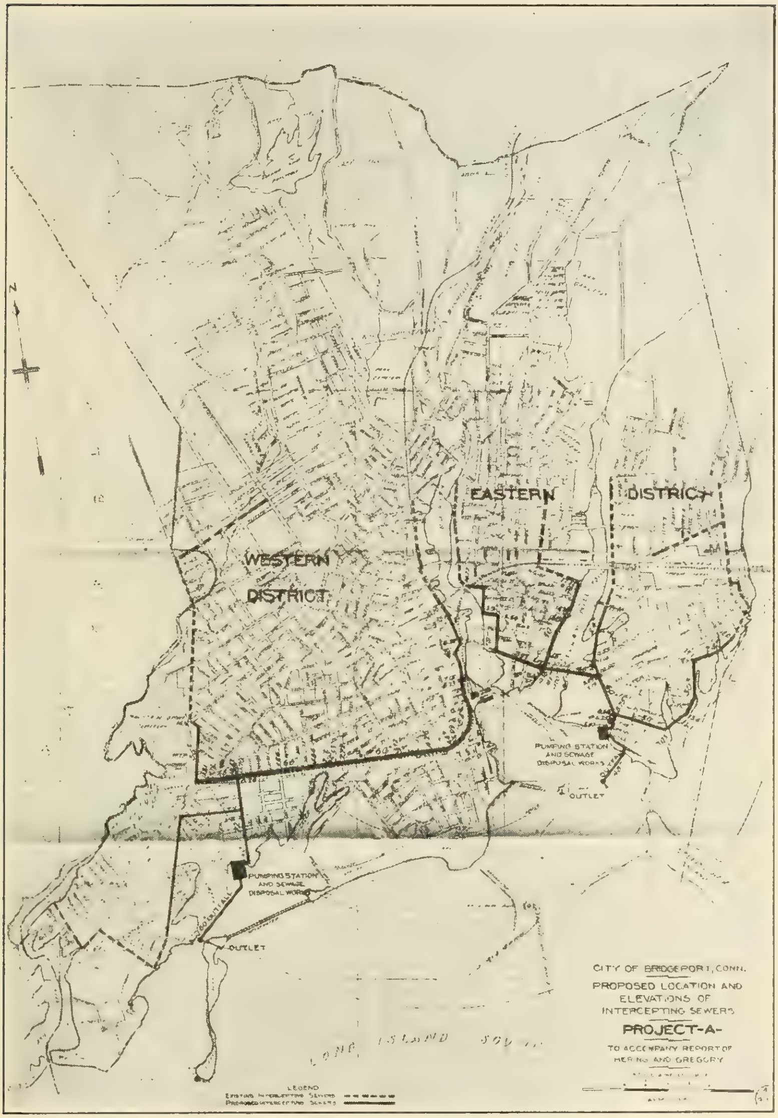
In the past all sewers in Bridgeport had been built on the combined system, that is, the same sewers carried both storm water and house sewage. These sewers, many of which were too small, emptied into the nearest tide water. The Pequonnock River which runs through the center of the city and naturally divides the city into two districts, which are now known as the Eastern and Western Sewage Districts, had about 26 sewers emptying into it, while Ash Creek which runs along the western edge of the city had 4, and Johnsons Creek, the eastern boundary, had 12. There were 8 sewers flowing into Yellow Mill Pond, in the center of the eastern district and 9 into Cedar and Burr Creek in the western district.

It was realized that the city could not continue indefinitely emptying sewage into these small streams some of which were hardly more than mud flats at low tide, and that at some time in the future it would all have to be collected and discharged into the sound through long outfalls, either with or without treatment.

The topography of Bridgeport is such that large areas near the sound are very low, and the Pequonnock River and other streams extend so far into the land at tidewater level, that it would be impossible to collect the sewage and deliver it either to outfalls or disposal work without pumping. To collect large quantities of storm water in combined sewers and then pump it, would add greatly to the cost of construction of the trunk sewers and to the pumping cost, so Hering & Fuller recommended separate sewers for rainwater wherever practicable, with storm water overflows



STARS SHOW OLD SEWER OUTLETS.


N
EASTERN DISTRICT
WESTERN DISTRICT
PUMPING STATION AND SEWAGE DISPOSAL WORKS
OUTLET
PUMPING STATION AND SEWAGE DISPOSAL WORKS
OUTLET
LONG ISLAND SOUND
CITY OF BRIDGEPORT, CONN.
PROPOSED LOCATION AND ELEVATIONS OF INTERCEPTING SEWERS
PROJECT-A-
TO ACCOMPANY REPORT OF HERING AND GREGORY
LEGEND
Existing Intercepting Sewers
Proposed Intercepting Sewers

INTERCEPTORS AND PUMPING STATION.

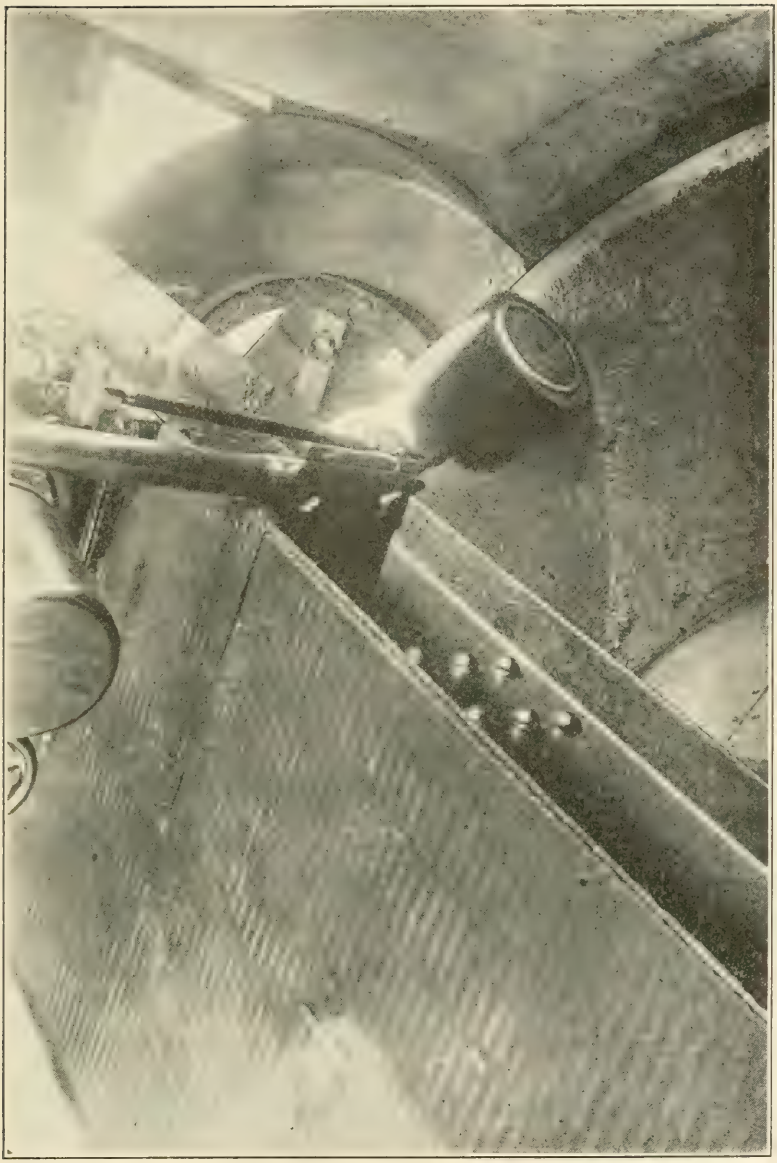
in some of the older sections of the city where the combined system would have to be retained.

They considered the city naturally divided into two districts by the Pequonnock River, and planned a pumping station and system of intercepting sewers for each district. It was their opinion that by carrying the outfall to deep water, i. e., 20 feet to 25 feet, no further treatment would be required; but suggested that when sites were acquired for the pumping stations, sufficient land be secured to enable the city to build treatment plants, if desired at some future time.

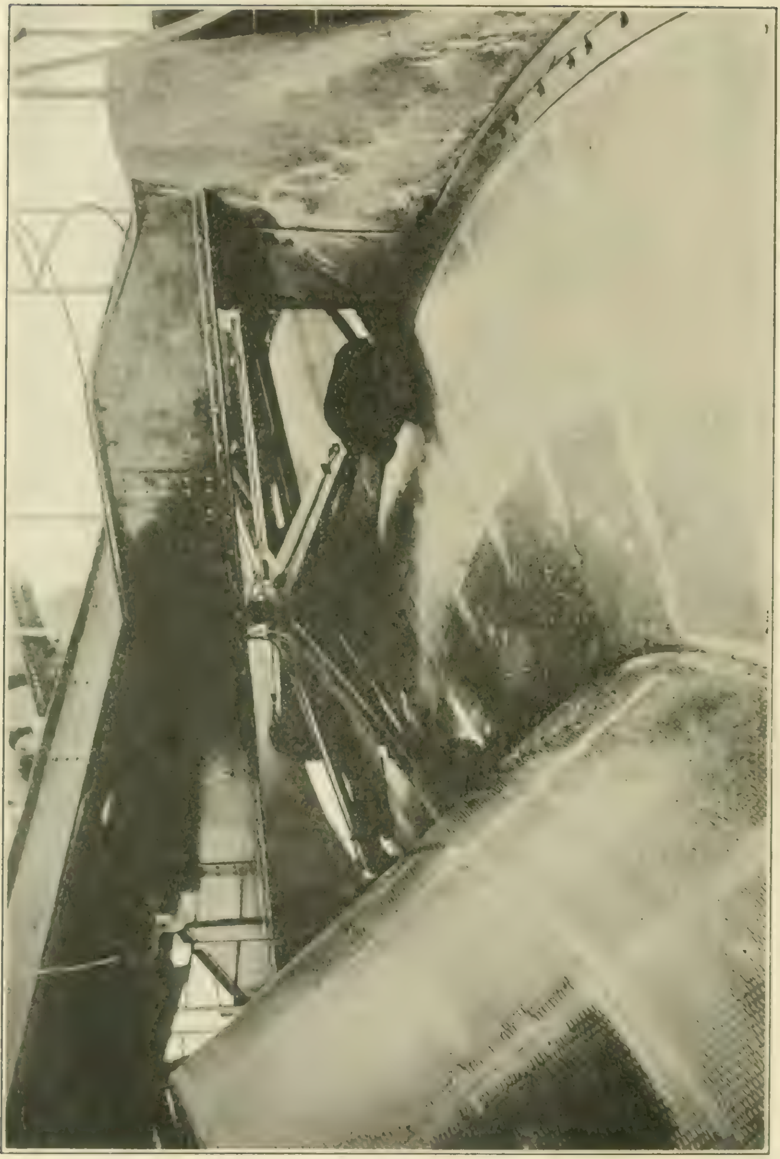
By 1916 practically all the interceptors had been completed down as far as the sewage would discharge by gravity. No further extensions of the interceptors could be made until the pumping stations were built. The firm of Hering & Gregory, successors to Hering & Fuller, were asked to review the work done to date and recommend a program for the future. They considered the advisability of bringing the sewage of the entire city to one treatment plant located on Steeplechase Island, but finally decided in favor of the original plan of Hering & Fuller which divided the city into two districts with a complete plant for each district.

As the Western District was the more important it was decided to finish that first; so contracts were let for the construction of the Railroad Avenue and Bostwick Avenue interceptor, and plans were prepared for the Western District Pumping Station at the foot of Bostwick Avenue.

The consulting engineers recommended an Imhoff tank sewage treatment plant and designed the pumping station accordingly. But, although the city did not intend to build the treatment works at this time, before letting the contract for the pumping station it was decided to investigate sewage treatment in other cities. So a committee consisting of the City Engineer, the Director of Public Works, the President of the Paving and Sewer Commission and the chairman of the committee on sewers of the common council, visited a number of plants including Fitchburg, Worcester, Rochester, Brooklyn, Baltimore, Plainfield and Wildwood, N. J. It was the opinion of a majority of this committee that the Riensch-Wurl fine screen method of sewage treatment was the most appropriate system for Bridgeport.



RIENSCH-WURL SCREEN. SCREEN ENTERING BRUSH SPHERE.



SCREEN LEAVING BRUSH SPHERE.

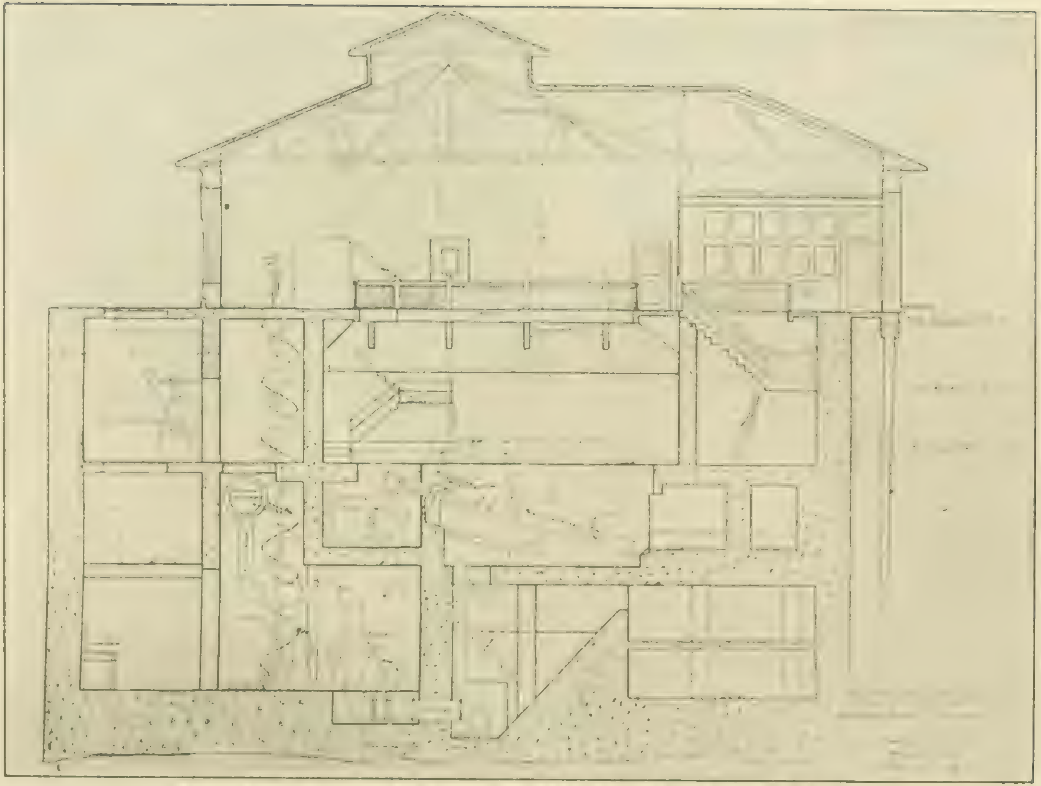
The report of this committee was submitted to two prominent sanitary engineers, George W. Fuller and George A. Johnson, for their advice. They approved of the committee's report; so new plans were prepared for the Western District pumping station, including screening and pumping equipment to take care of the present sewage of the district, with provisions for the installation of additional equipment when required in the future.

The principal reasons which led the committee to decide on the fine screen rather than the Imhoff tank method of treatment was the uncertainty of the action of Imhoff tanks. It was noted that several Imhoff plants, designed by competent engineers, were unsatisfactory, while few of the plants which were giving satisfactory service were handling the amount of sewage for which they were designed. As Bridgeport's Western Treatment Plant was to be located on the southwest edge of a well populated district, with the prevailing winds coming from the southwest, it was thought best not to run the risk of having another such experience as they had in Plainfield, where they have finally had to install a Riensch-Wurl fine screen ahead of their Imhoff tanks.

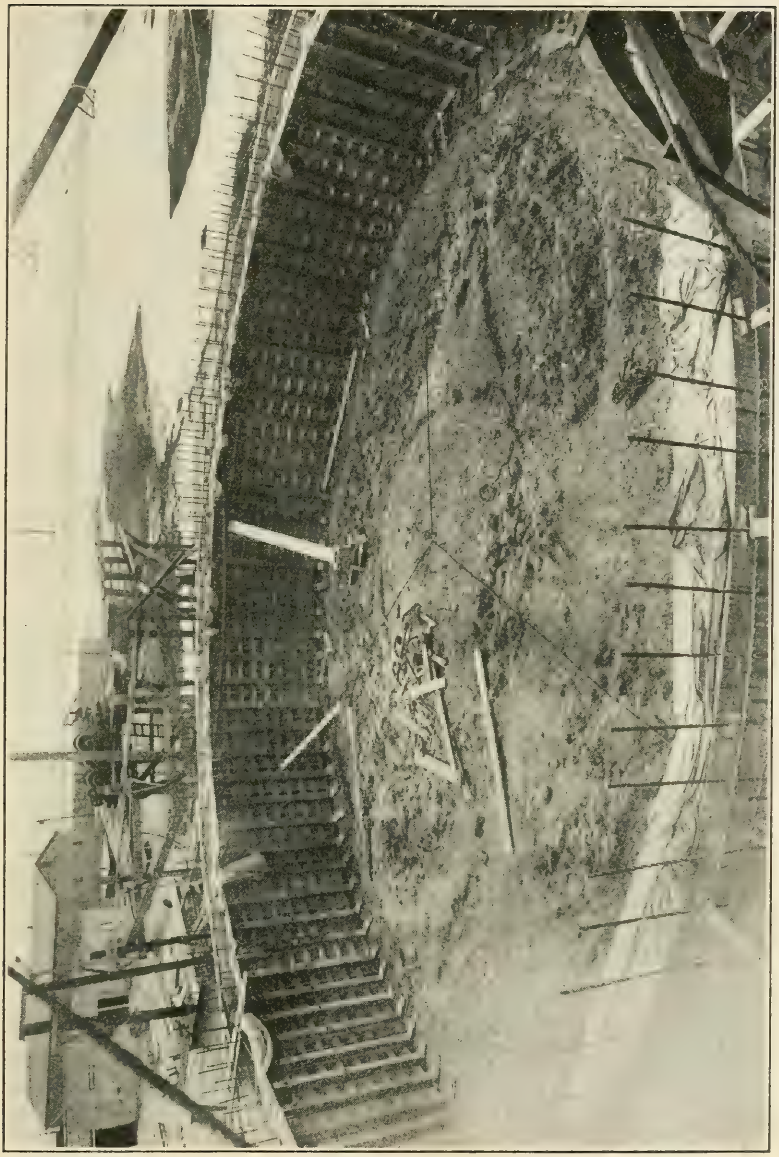
The original Hering & Fuller report recommended disposal of Bridgeport sewage by dilution. The process finally adopted was that of clarification by fine screens, followed by dilution. If further treatment is desired at some future time, the outfall can be extended, or if necessary additional treatment works can be built on land.

The flow line of the interceptor at the plant is at elevation 100, 22 feet below the street level and 10 feet below mean low water. Several combinations of screens and pump were studied including the plan of having high level screens following the pumps, so that the screened effluent would flow by gravity to the outfall. This scheme would have saved something on the cost of construction of the station, but it was discarded mainly because the screens would be more effective if installed ahead of the pumps.

In the plant finally decided upon, the sewage from the 71-inch interceptor flows through the sluice gate to a bar screen at elevation 100, thence through a concrete channel to the R-W Screens. The screened effluent flows over an adjustable weir to the sump at elevation 80 and is then lifted by the pumps to the force main at elevation 105.



SECTIONAL ELEVATION OF PUMPING STATION AND TREATMENT PLANT.



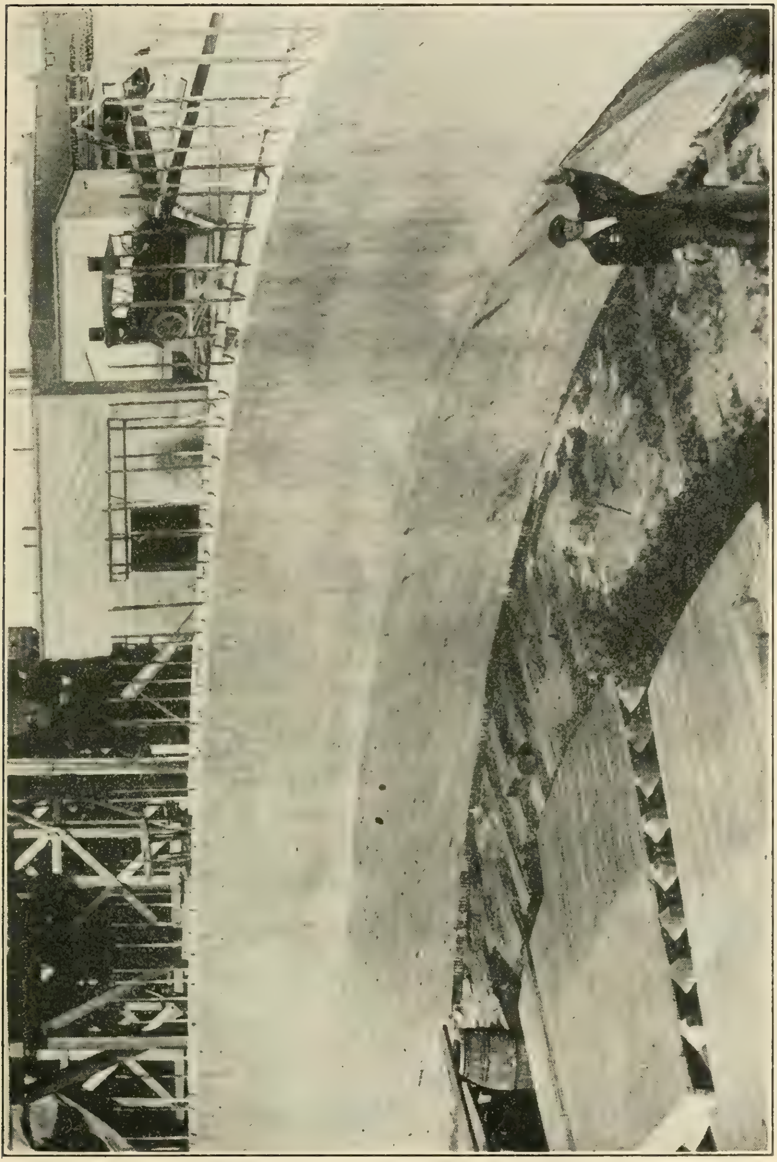
FORMS IN PLACE FOR FIRST RING.

The plant is designed for three Riensch-Wurl screens, to handle a total dry-weather flow of 35 million gallons per day. The estimated population of the district when fully developed is 180,000. As the present population of the district is in the neighborhood of 100,000, two screens will be installed now and the third one when needed. The R-W Screen consists of a circular disc 22 feet in diameter inclined at an angle of 15 degrees to the horizontal. A truncated cone 12 feet in diameter, at the base, is centrally mounted on the disc. The surface of both disc and cone consists of a number of removable bronze plates, perforated with slots two inches long and 3/64 of an inch wide. The lowest point of the disc is set at the elevation of the influent, and the slope is such that about one-third of the disc will be above the surface of the water.

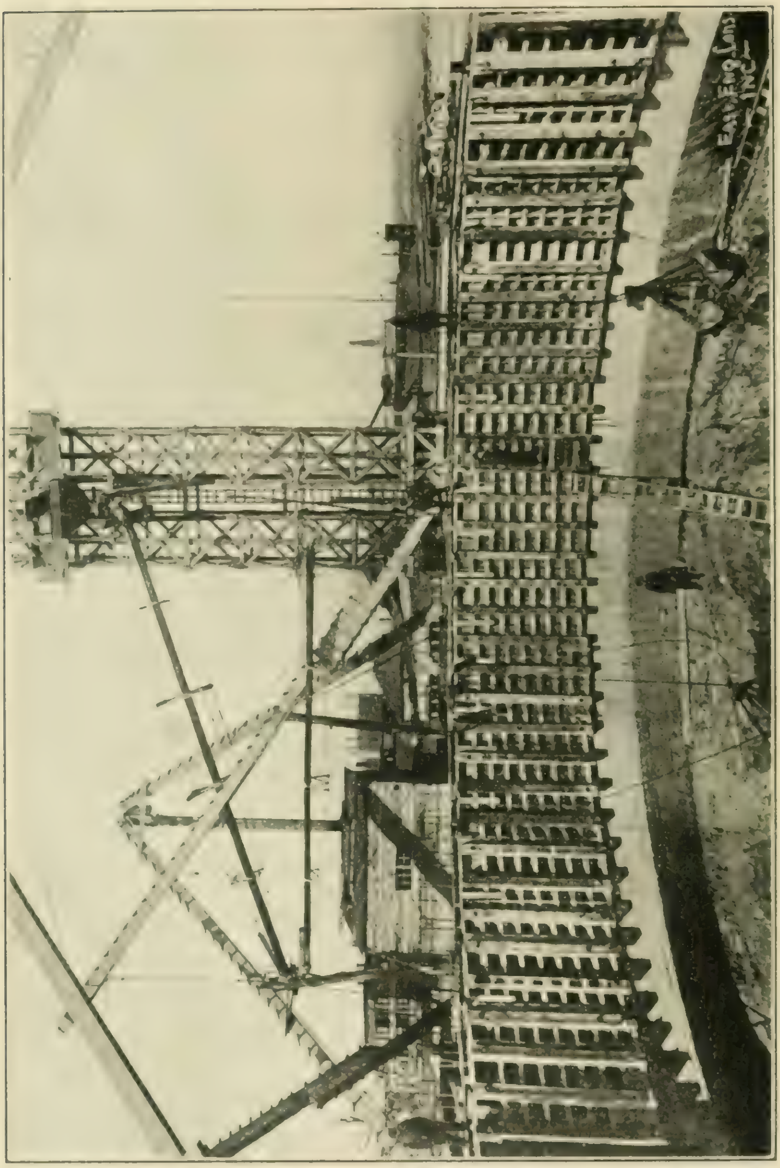
The sewage flows on to the screen which is revolving at a rate of about one revolution in two minutes. The liquid passes through the perforations in the disc and flows over the weir into the pump sump. The suspended solids, which are retained on the screen are lifted out of the water as the screen revolves, and are brushed off the screen into the hopper of the screening conveyor system. The brushes are cylindrical and are carried on a revolving spider which is mounted on a shaft parallel with the main disc shaft. These brushes work on the same principle as a street sweeper, which is carried along the street mounted on a truck and at the same time is revolving and brushing the refuse ahead of it.

The screenings are conveyed from the hopper to the storage tanks by a pneumatic system which does away with the necessity of handling it in open cans or on an open conveyor-belt. From the storage tank which is located 10 feet above the street level, the screenings will be dropped into tank wagons, carted to the town farm and buried.

The pumping equipment consists of two 20-inch horizontal centrifugal pumps each having a capacity of 15 million gallons per day and two 15-inch horizontal centrifugal pumps with a capacity of eight million gallons per day each. These pumps will be direct connected to electric motors, controlled by floats in the pump sump. The floats are adjustable and electrically connected to switches and automatic motor starters, mounted on panels of the main switch board.



FIRST RING AFTER FORMS WERE REMOVED.



FORMS IN PLACE FOR SECOND RING. SHOWING METHOD OF EXCAVATING.

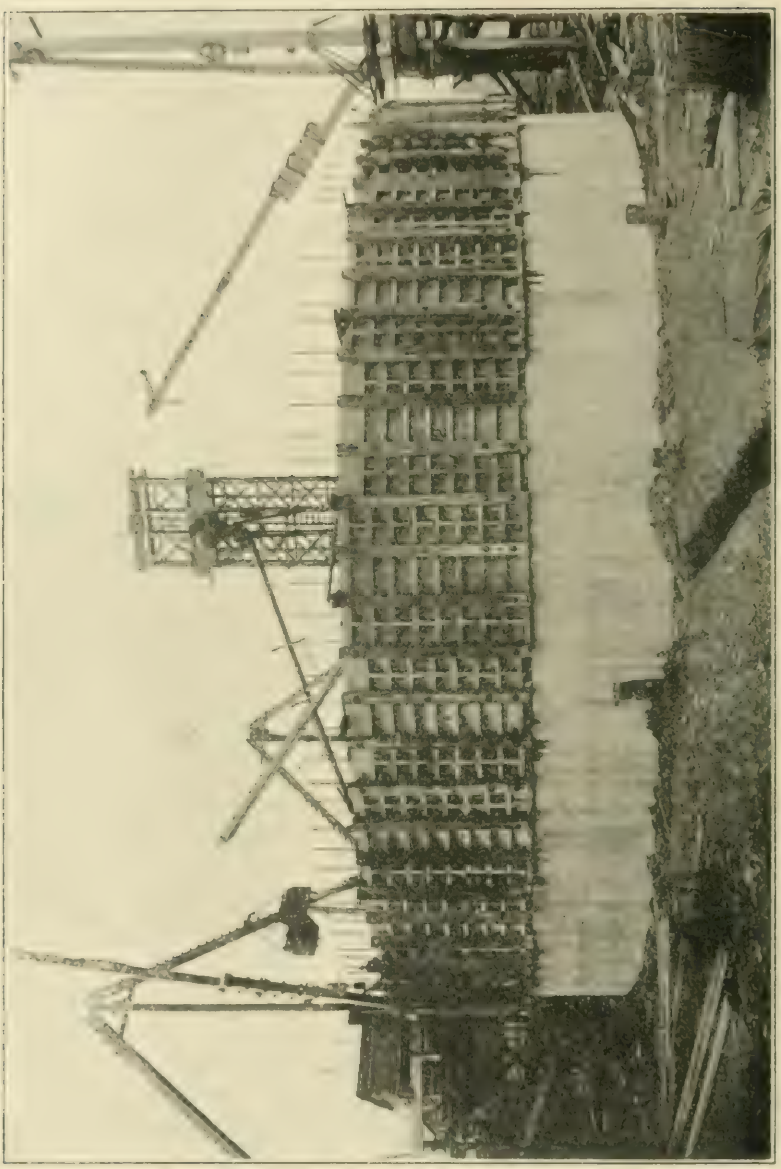
A Venturi tube is to be installed on the outfall, with the record-chart and register located on one of the main switch board panels. The 60-inch gate valve, electrically operated, will be installed in a gate house at the discharge end of the venturi tube.

The building will contain a complete system of heating, ventilating and plumbing, including toilets and shower baths.

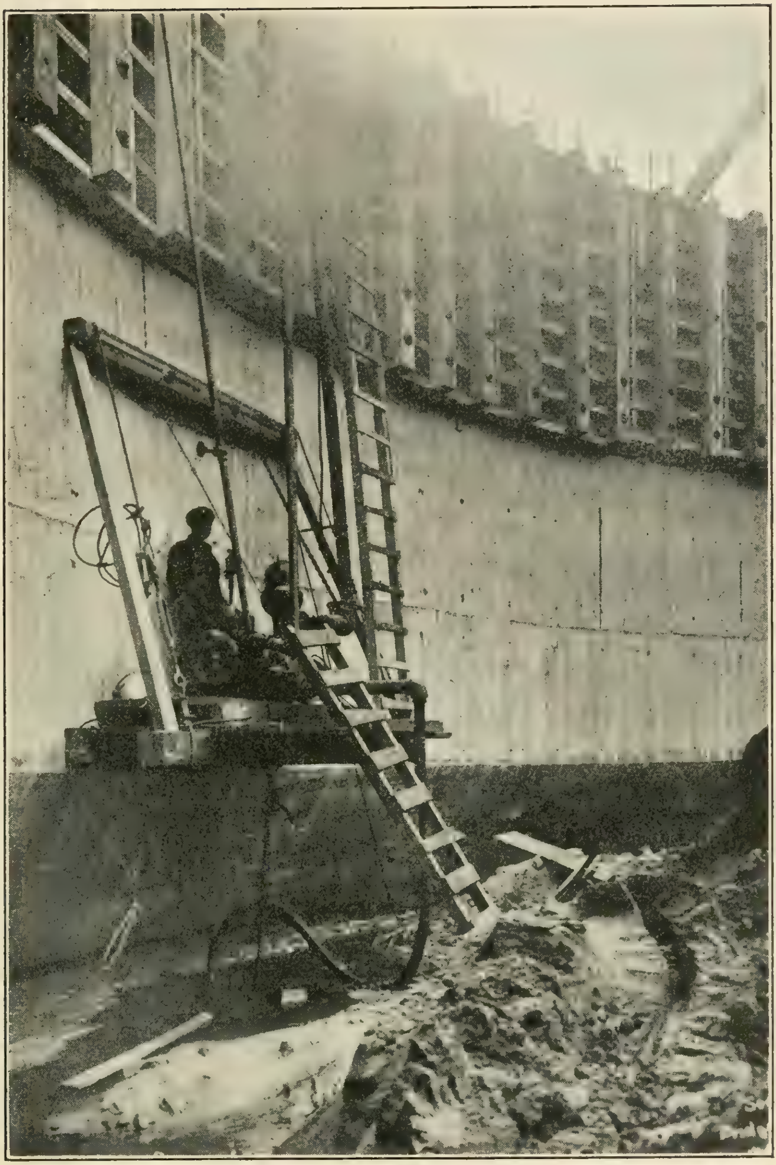
The State Board of Health approved of the plans, for the plant itself, leaving the question of the location of the outfall to be decided later, so construction was started about the first of last year, 1919. The substructure is a reinforced concrete caisson 80 feet inside diameter and 45 feet deep. The cylindrical shell forming the outside wall is constructed of a series of rings ten feet high. The rings were cast above ground and after the concrete in each ring had properly set, the forms were removed and the ring sunk until the top was approximately a foot above ground. The forms were then re-assembled and the next section cast. When the caisson had reached the predetermined depth the bottom was placed under water. After the concrete bottom had set, the caisson was unwatered, the bottom made smooth and finished to a surface. This part of the work is finished and the inside walls, partitions, beams and floor slabs are now being built. The rectangular superstructure will be constructed of tapestry brick with stone trimmings and a red tile roof.

The lowest ring, which contains 475 cu. yds. of 1-2-4 concrete and thirty tons of steel, was completed in March of last year. After a few days the forms were removed and set for the second ring. The same forms were used for all five rings. The second, third and fourth rings, each containing 500 cu. yds. of concrete and 16 tons of steel, were finished by June 1st, the concrete being poured in continuous operations of about eight hours for each ring.

After the first ring had been poured and the forms removed the ring was allowed to sink by excavating the material from the interior. Two three-quarter yard clam-shell buckets on two 65-foot boom stiff-leg derricks, set up on opposite sides of the caisson, averaged about 200 cu. yds. of excavation a day. One derrick was placed on the north side of the caisson, the other on



FORMS IN PLACE FOR SECOND RING. SHOWING ALL THREE DERRICKS AND CONCRETE TOWER.



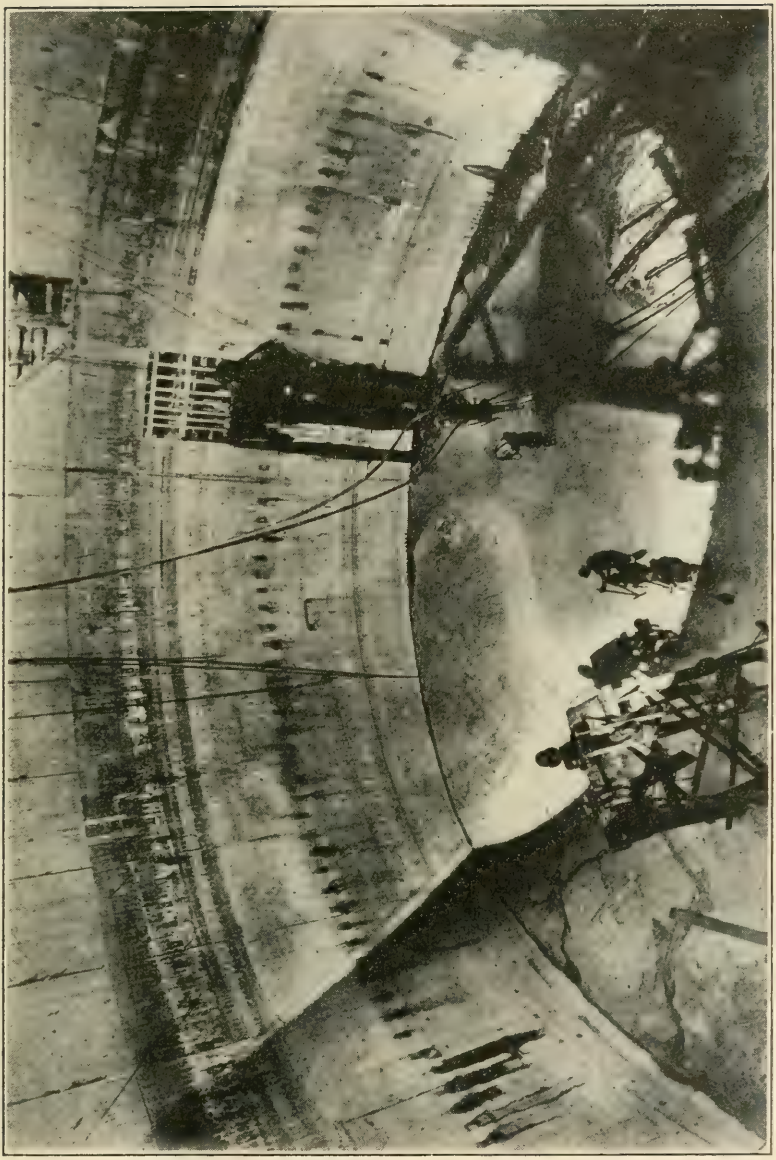
FORMS IN PLACE FOR THIRD RING. SHOWING PUMPS.

the south. On the east side, towards Bostwick Avenue were two one yard mixers and an 80-foot double hoisting tower from which the concrete could be delivered through chutes to any part of the ring. Just north of the tower was another derrick which supplied gravel and sand to hoppers located above the mixers. As the excavation proceeded levels were taken at frequent intervals each day on the top of the shell and if one side was found to be sinking too fast, excavation was stopped on that side and continued near the other side until the ring was level again. At no time was the caisson more than nine inches out of level. At first it was not intended to keep the caisson dry during excavation, but as the work proceeded and it was seen that there was not much water coming in, pumps were installed and the interior was kept dry during this part of the work.

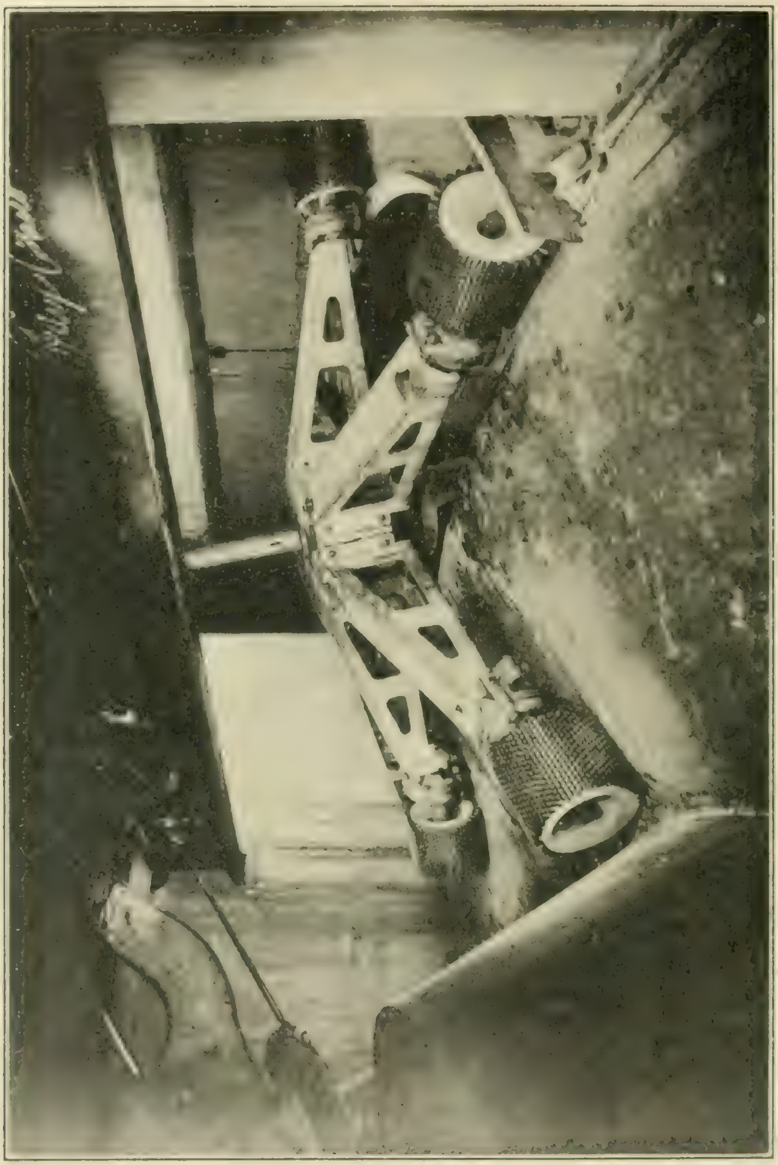
Several of the engineers who looked over the job before the contract was let said it would be almost impossible to sink this caisson, as the skin friction on the outside would hold it up. As a matter of fact it went down so easily that the top ring was left off until the caisson was within three feet of the bottom. Progress had been so satisfactory up to this point that an attempt was made to excavate still further and try to lay the bottom in the dry. It was found, however, that the pumps were drawing too much sand, which, flowing in from the outside under the bottom edge of the caisson was undermining the derricks and concrete tower. So the top ring was put on, the caisson was allowed to fill with water, and the excavation was continued until the ring was down to the predetermined depth and soundings showed that the excavation for the bottom was completed.

The bottom was then put in under water in one continuous operation. The same gang worked right through and put in 1800 cu. yds. of concrete in thirty-nine hours. The men were allowed to knock off occasionally for rest and refreshment, but the mixers were kept going continuously except when shut down for minor repairs. There was a two hour delay about noon of the first day, and the plant was shut down for about five hours at different times during the second day.

The bottom was allowed to stand three weeks, then the water was pumped out. No leaks were found so the floor was finished



SHOWING BOTTOM (PUT IN UNDER WATER) AFTER WATER HAD BEEN PUMPED OUT.



RIENSCH-WURL SCREEN IN BRIDGEPORT PLANT.

and work was commenced on the forms for the inside walls and partitions. The plant is expected to be in operation about the first of August.

The very interesting paper on "The Elimination of Grade Crossings," by E. Irvine Rudd, Engineer of the Public Utilities Commission of Connecticut, together with several very descriptive pictures was lost and could not be replaced.

(The pictures, illustrating this article are, nearly all, paid for by the Sanitary Corporation, of New York City, which intends to use a reprint.)

STATE PARKS.

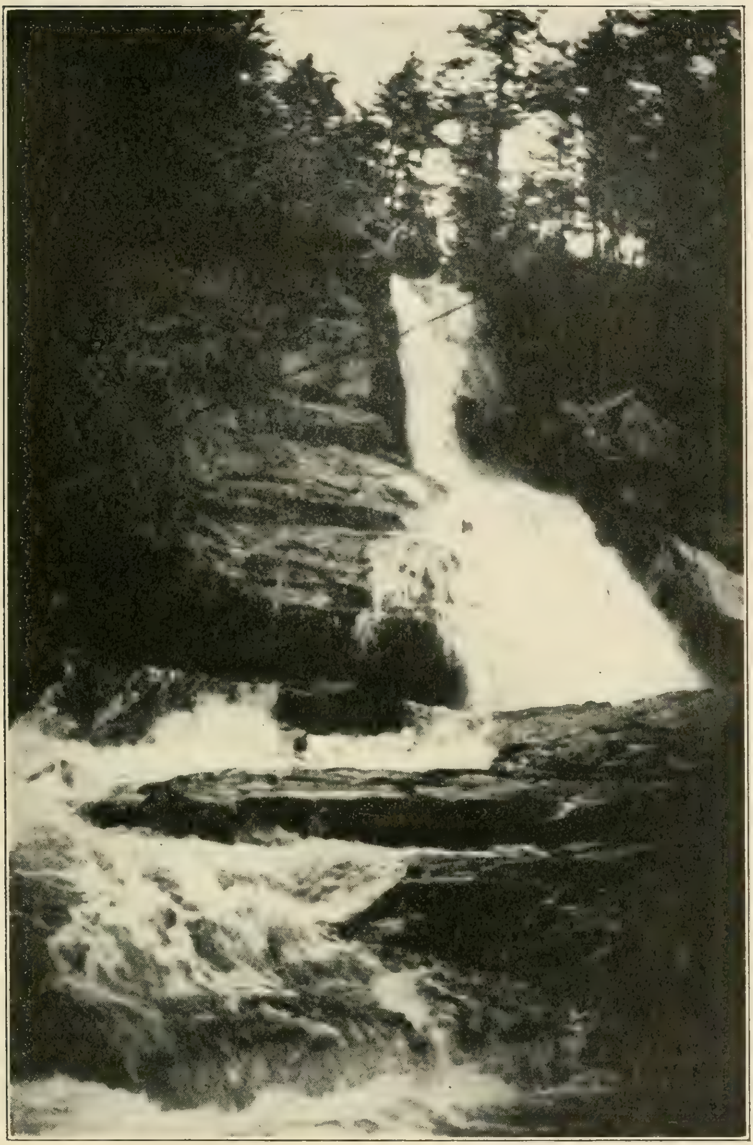
By Albert M. Turner, Field Secretary, Connecticut State Park Commission.

I do not know that it is necessary to make an apology, but at the same time I feel it would be proper to make some excuse for dragging so frivolous a thing as state parks into this technical body. It was none of my idea. Perhaps you don't know that the President of this Society, the retiring President has been since the first of last July on the State Park Commission. That was not entirely *his* idea. Perhaps he will now call it square.

The State Park Commission was established in 1913, the year before the war began. I began to work for it in 1914 and have been there since. It should be a matter of some interest to this Society that the Commission turned to the civil engineers for a man whom they styled a "Field Secretary." What that was I didn't know exactly. I have been trying to find out.

The first problem was the acquisition of land, which problem it was felt an engineer could solve as well as any one. The development of a maintenance administration I do not feel fitted for, and have not attempted that part of the work. Recently the Commission secured a General Superintendent, who will attend to the executive end of it, and leave me free, as in the past, for the work of acquisition.

This Society has been kind enough to back up the project of state parks ever since its inception, and I think the efforts of the Society have been effective. Three appropriations for the purchase of land, at $20,000 each, did not get us very far. The last General Assembly approved a recommendation for an appropriation of $200,000 for the purchase of land. That has permitted the acquisition of a considerable area on the shore of Long Island Sound, at a point selected previously, in the Town of Madison, called Hammonasset Beach. The State owns half of it and eventually expects to own it all. At present part of it is used by the Winchester Repeating Arms Company for proving grounds, but they are nearly ready to give it up. We think we have enough, however, for a beginning. The acquisition includes



KENT FALLS, CONNECTICUT STATE PARKS.

now about 500 acres. There was an appropriation for $100,000 for development work, most of which will be used at that place during the coming season. It might be well to have the summer meeting of the Society at that point, unless there is something of greater importance. I have no pictures of that particular site. It does not lend itself to pictorial representation.

The pictures I have were not taken with the notion of presenting them to the Society. Most of them are reproductions from vest pocket films. I have carried a camera with me most of the time. I have hundreds of pictures, some of which I find useful.

The total sum of state money expended for parks now amounts to something over $200,000. The acreage is nearly 5,000, of which about forty per cent has been given, not purchased. That represents only a small proportion of what the State should do. There are many natural beauty spots in Connecticut. There is a great deal of land fitted for such purposes—recreation and the preservation of scenic beauty, and not particularly well fitted for anything else.

The proposition of the Park Commission is not to turn these lands over to nature absolutely, but to harvest a crop of timber perpetually. I think that will be possible. There is very little land in Connecticut which we can afford to let go wild absolutely. A good deal of it is natural park land and can be handled as a forest proposition, and in time an annual crop taken without disadvantage. Some points should not be treated that way. The acreage of Connecticut is about three millions, and one-half of that is natural forest land.

(About sixty colored stereopticon pictures of various features in the State Parks were shown accompanied by remarks meant to be explanatory, but which without pictures are entirely irrelevant. They are therefore omitted and a single plate inserted showing Kent Falls as an example merely.

The printed reports of the Commission contain detailed information and illustrations and may be obtained from the field secretary by request. The next report will be issued about January, 1921.)

EVENING, TUESDAY, FEBRUARY 17, 1920

Dinner, Hartford Club, Prospect Street, Hartford

About one hundred and fifty present

AFTER-DINNER ADDRESSES.

DR. F. B. JEWETT: I don't know as it is quite fair to give you gentlemen another dose without giving you a chance to put on your gas masks, after the amount of hot air I passed out this afternoon. I feel somewhat like the watchman over at the Acme Building in New York is reported to have felt, one time. It seems, according to the story, a little red-headed Irishman applied to the Western Union office for a job. They told him they didn't have any job for him at that time. As he was going out, the manager said, "Wait a minute. Can you deliver these messages?" "Sure," said the Irishman, "I will deliver the messages." "There is a place over here," said the manager, "called the Acme Building, and we seem to be having difficulty in getting messages delivered there on account of the watchman. He will not let the messengers in. Do you suppose you can deliver those messages?" "Sure, I will deliver them." So the manager gave him the messages and he disappeared. After a while the telephone rang, and the manager answered it. A voice said, "Is this the Western Union office?" "Yes." "This is the watchman at the Acme Building. Have you a red-headed messenger?" "Yes. What is the matter? I had him go over there to deliver some messages." "Well," said the watchman, "he is an obstreperous devil; I had to pull my gun on him." "I am sorry about that," said the manager, "I will send right over there. I hope it isn't anything serious." "No," replied the watchman, "but I want my gun back." That is about the way I feel, after having shot my bow this afternoon.

I would like to talk shop a little more. Particularly in regard to the sound ranging that I spoke of this afternoon. I don't know how you men feel about the League of Nations, the Treaty of Peace, preparedness, universal training, and what not, but there is one thing in connection with the other things which are regrettable in connection with the recent war, particularly from the standpoint of this country, and that is the disappearance of that wonderful organization which you had in Connecticut at New London in connection with the submarine base and experimental station. The work done by the group of men gotten together at that station during the war, comprised the finest group of able engineers, I think, that was gotten together during the war; the only group that worked absolutely harmoniously from start to finish, and most of them were civilians.

Developments down there were momentous. Those things which we saw briefly this afternoon, those devices for detecting hostile submarines, were probably the finest adjuncts to safeguarding navigation that were ever developed. True, you could detect submarines with them, in war time, but don't you see that that same apparatus makes it absolutely certain that you can avoid collisions at sea? You can bring ships into port in stormy weather. The same type of apparatus is useful, a thousand times more useful, in peace time, than in war time.

And that work was just coming to fruition. That group of men were perfectly willing to stay on the job. But now that whole organization is gone. There isn't a man of them left in New London. There isn't a man left, in the whole of that group. And no commercial organization can hope to attack that work and complete it, because it is costly, and requires ships. It is the kind of a thing for the Navy to accomplish, and the Navy could have carried it on with a minimum expenditure. They could have kept that group, or part of it, together. Now it is all gone. It is a very great loss, not only to the State of Connecticut, but to the whole nation, that things had to be as they have been.

Now, the other item of shop talk. You know I am mixed up in the telephone business. Some of the things which were done during the war with communication lines were startling to us on this side of the water, and in the time we had at our disposal, we made much more progress than had been made on the other side. I have tried to decide what caused that, and have come to the conclusion that the reason we succeeded in that line, as we did in so many other lines, during the war, is because we in this country have learned the value of standardization—getting and developing a uniform type of thing. Using the telephone as an illustration, whether the service is good, bad or indifferent, it is much better in this country than anywhere else in the world. Because we in this country have learned the lesson of getting a good thing, say our transmitters and receivers, if you will, and using them universally until we had a better thing. Working from that standpoint, we have built up the system we have here. The reason they failed on the other side was because they had not learned that lesson—because they are in the same condition that the railroads were in this country sixty or seventy years ago, when they had forty-leven different kinds of things on their tracks—a sort of a highway on which everybody had his own vehicle. That is about the state of the art to-day in France, in the telephone field.

To show how poor the telephone service is in France, in comparison with what it is here. You know what we have in the way of telephone transmitters and receivers. You use it frequently. The desk set. You go to New York, Los Angeles, Montana, and find exactly the same type. In France they have 580 different types of substation apparatus, 109 different types of instruments, which the subscribers own.

They had occasion to install an automatic exchange in the city of Marseilles. When the exchange came to be cut over, pandemonium reigned. Half the lines in the city were out of commission. Nothing happened. The thing went on, day after day, half the lines out of service. Finally the installer, in this case an Englishman, went to the manager of the exchange and said, "I have had some experience in cleaning up trouble, perhaps I can help you out." The manager told him, "If you can, the whole service is at your disposal; you are boss of the gang here, and I will tell them so." So the installer went down in the test room, and found forty or fifty men there. He said, "I have come to help straighten things out. Who is boss down here?" The reply was, "There isn't anybody boss; we are all equal down here." "Who knows about the records?" "Records? There are no records." Finally they pointed out an old man in the corner, and said that he had been working there ever since the exchange was started, and he knew about where the lines were. Finally a greasy ledger was discovered, containing some of the records. After they had been working at it a couple of days, the prefect of police came in, very hot, and said, "This telephone service is simply punk. If you can't clear it up, I will take over the whole place. My lines have been out of commission for three days." So they looked up his line and found it was in trouble. They went to his place and found he had a hand set, one of the kind you have to hang on a hook. He had a nail driven in the wall, and hung the telephone on a nail, and the result was his line showed up in trouble. At the central office they had plugged it up as being in trouble, when they tried to call him they couldn't get him, and there you were.

A lot of other things we were able to do in the short time at our disposal and so far away from the seat of war, because we had learned the lesson of standardization and of team work. I do hope we shall be able to make use of that lesson of team work which we have learned, and regret that we did not apply it to keep that gang together at New London.

PRESIDENT BENNETT: It is my great pleasure to introduce Edward L. Smith, United States District Attorney, ex-Judge of the Court of Common Pleas, and at one time Mayor of Hartford.

MR. SMITH: Mr. Chairman, gentlemen. If I were not District Attorney and therefore obliged under the law to bring action I would suggest the proper move would be to fill the flowing bowl.

I am deeply grateful to Mr. Bennett for giving me the opportunity of coming here to this table to speak to you, and to you gentlemen for letting me know so far in advance. Of course, as Judge of Common Pleas, with civil jurisdiction only, I had no opportunity of meeting the criminal classes.

I have had a lot of titles used when the Chairman presented me. He said I was a judge. In baseball many men go to the bench when they strike out. I have a little daughter at home who has heard the phrase "on the bench," in and around the house for the past six years. The other day at dinner she startled us by asking, "Mother, where is the bench that Daddy sits on?" Mother replied, "In the court room." The little girl's face brightened, and she said, "Well, I always thought it was in the park."

It is pleasant to stand here and try to speak into the faces of a group of men, many of whom the speaker knows well, and try to convey a sensible idea. I have great liberty, to-night, for the Chairman has not directed me to speak upon any particular subject. I have no particular text to talk on. The text of an after-dinner speech is a mere pretext, anyway. It is a point of departure, not a point of arrival, and, to avoid risks, for some speakers it is very much better to say what you have spoken about after you are done, rather than to endeavor to say what you are going to speak about.

I have no license, governmental or poetical, to address engineers of any type whatsoever. I have never been an engineer, and I am not, except as a man in law comes to be, familiar with your technique. But, however much my appearance may belie it, I did once have a fancy for mathematics, and from my desultory reading I understand that mathematics is the basis of your profession. Doubtless you have heard of the woman who visited a college town, and there met an old professor of mathematics, with whom she shook hands and said, "I am glad to meet you. My son Harry took calculus from you." The old man replied, "Well, to be exact, he did not take calculus from me, he was merely exposed to it."

In my career as a mathematician I have found the square of the hypothenuse equal to the sum of the squares of the other two sides, and felt it a remarkably square deal from start to finish. I have proved the problems of Euclid as given in the text book, with such modifications, of course, as you modern geometers and civil engineers and Dr. Reinstein have suggested. I have gone so far as to endeavor to understand the theory of vector analysis, although I have not stained my fingers with the kind of pitch that you handle every day. As a citizen of Connecticut, I have a sort of apprehension that one of the greatest men that ever lived in Connecticut was Willard Gibbs of New Haven. So I feel a sort of an attraction for the thing that lies at the bottom of your profession.

You know, in the philosophy of thinking, it is an open question whether the law is a science or not, but there is no question whatsoever but the engineering profession is a science. The law has either a human or an inhuman element in it that is irregular, varying, and of such type that almost every definition in law is surrounded with a twilight zone. It is not the kind of a definition that you gentlemen use. For instance, the theory of evidence, the tests of credibility are essentially human and cannot be stated in mathematics. In your work you can rely on data which you can see. You can use the axiom that two and two make four, and that the area of a circle is 3.1416 times the square of the radius, but there is no such thing in law. We put a man, John Doe, under oath, and then try to determine by what tests of credibility we can find, whether or not John Doe under oath is swearing like a pirate or not.

There is a word used in connection with engineering that is used in law, a word full of integrity—the word "civil." In the phrase "civil engineer" are embraced almost all types of engineers. The phrase, civil engineer, was adopted to distinguish some of you from others of you. The old engineer was distinctly a military engineer, and most engineering was military. When the forces of civilization began to develop along the lines of peace, they began to try to dominate the forces of nature, and then they began to use that phrase and to call you "civil engineers." For the purposes of peace, not of war, you went out, and you built roads and constructed canals, and you did all your other wonderful works, and in that work you were fighting in time of peace for exactly the kind of a thing that a decent lawyer or a decent clergyman is fighting for, the domination of truth.

I have listened to Dr. Jewett, and it is interesting to know that when the United States found it necessary to call into the war its reserves of manhood, it was the civil engineer who was invited to form a group that would be military engineers temporarily, and they did their work and completed their job, and, although Dr. Jewett regrets it, they have disappeared back into the society out of which they came, and into the industrial army, founded, not on war, but on peace, and which depends, in so far as any organized industrial army can depend, upon you gentlemen for its continuity.

If you ask a lawyer to define justice, he will say, if he follows Emerson, that justice is the application of truth to the affairs of men. A lawyer has to work out a work-a-day truth that will satisfy a work-a-day world, just as you men are engaged in applying to physical nature that idea of physical justice, physical truth, in matters of stress, strain, pressure, and your search for truth is as high and as noble as any search for truth conducted by any court that attempts to administer justice, and it is such a search that you yourselves know, without my telling you, that no liar can have any part in your service. If a bridge builder tells an untruth in his work, his bridge falls down. If a judge tells an untruth in his administration of justice, he merely works an injustice. But physical nature answers, every time, and will not admit of any decision except the truth.

I have called your engineering service a profession. There is a good deal in that word "profession." It is capacious, and worth considering for a moment. A profession is a type of service which demands of a man that ethical attention and activity far above that which is demanded of the man who merely performs work for a wage. I do not mean to belittle in any sense the wage earner, but the engineer does not work for a wage, for he is in search, if he is an honest engineer, of truth. He works, and I hope he gets it, for a fee, not a wage, and there is something in his work of higher ethical import than there is in the ordinary English word "work." For instance, the engineer is bound by a deeper knowledge of truth—or he ought to be so bound—whether he is or not, is up to him. He is engaged in an activity for which he is specially trained, and the performance of which has a definite effect upon the community. I do not suppose he is bound by a professional oath—I do not know exactly the bearings of you gentlemen toward each other, but it is immaterial whether he is bound by a professional oath, he is bound by an implied code of honor which binds all men who start out in this world in search of truth. Whether it is written in the books or not, it is written on your souls, if you are in search of truth, there is a code of honor among you, and you know that a breach of that code of honor is unprofessional. It is not difficult for you men engaged in engineering to know what is unprofessional, the difficulty is in making the definition. The difference is expressed by feeling, not thinking. A court of honor is not moved by reason, it is moved by something higher than reason. It is moved by reason illuminated with emotion, and it is that illumination that spreads through your service and lifts it up from mere work, to a profession. However that may be, you gentlemen know yourselves, without anyone telling you, that there is something that binds you together, outside of the mere fact that you are engaged in work that is somewhat similar. You have crystallized yourselves here into an association and you call it an association of engineers, and you do occupy, no matter where you happen to live, you do occupy in the commonwealth a certain place in the life of society, and you do function therein, whether well or not depends upon yourselves and on nobody else.

What is the function of an engineering society such as we find here in Connecticut? Well, it is difficult to phrase it exactly. Anyone who discusses this type of question is likely to do so a little cloudily. First, the civil engineer is an expert in his own technique, for without that he cannot hold himself out to be an engineer. The dabster cannot search for truth in company with those who know their subject. In the second place, the engineer usually exercises that technique to secure his livelihood, because that is the first duty that rests on his shoulders. When I say his livelihood, I mean the livelihood also of anyone that normally depends on him; and again, he ought never to allow his technique to be used in the interests of others to the danger of the commonwealth.

There is in the bar such a tight association, such a definite code of ethics attached to the practice of law, in theory at least, that anyone who offends against it is presented before the court and disbarred. Your profession is a little higher than the law, for you would not impeach an engineer who was unrighteous, but you would expel him automatically from his comradeship with you.

The engineer should guard against using his technique to the danger of the commonwealth, no matter what fee is offered to induce him so to use it. The idea of the commonwealth is a most important idea, to my mind, that can exist in a democracy. Every man, woman and child in this community—call it the State of Connecticut, or call it the City of Hartford—lives but one life, and in leading that life, each one spins a thread; as the lives move back and forth the threads are spun, and eventually there is woven together a fabric which may be called the community life. Therefore it is up to everyone who has an education above the average, and who has the technique because of his training, so to spin that his thread may be strong. If his thread be weak, it will mar the strength and beauty of the fabric, and in a democracy the only product worth having is that fabric that we talk carelessly about as community life. Each one of you gentlemen in his own community represents a trained mind, a trained intellect, with the knowledge of truth and of a code of honor, so that it is up to him to see that the thread he spins into the fabric is of silk, increasing the value of the fabric. If he spins a weak thread, the loss will be not only his, but the community's.

I suppose the men I am talking to in this room in this rather casual way are mostly somewhat around my own age in years. Some I know are beyond it, and some are younger, but as a body of men I think you are along towards middle age. There is one comfort in middle age—a man of middle age who has lived a decent life and has been fairly prosperous, can think of cheerful yesterdays and confident to-morrows.

I have often thought, especially in the last four or five years, that we in Connecticut live in a remarkable place. There is a stretch of land in the United States, say from Portland, Maine, to down below Washington, possibly, and back from the coast line for say 100 miles, that by a fair estimate includes industrial and intellectual activities that are remarkable, and that stretch of land probably is going to be, before many centuries go by, as remarkable a place in the world's history as those wonderful places we read of along the Aegean Sea or the Italian peninsula, or that little corner of Europe that was the germ out of which the British empire was built. We live in a corner of the world that is destined without question to be one of the most wonderful corners of this spot that men call the earth. And you live in the middle of it, in contact with the most active and intellectual part of it, Boston and New York, and you form the community in which you live, and are a part of the active cells that are building a thing that will live down the centuries. It is an opportunity, to-day, to belong to a profession where men are no longer hewers of wood and drawers of water. It is a fine thing to live in a corner of this country like New England—a trained man, with a trained intellect, and a heart that ought to match his intellect, with the opportunity of work to do in the service of truth, and with no other ambition except the ambition of Tennyson at the end of the poem of Ulysses, following knowledge like a shining star, beyond the utmost boundary of human thought.

I wish there could be imported into the law that type of thinking that is the note, the mark, of the well-bred and well-trained engineer, the mark of accuracy, exactness. I have told you in a sense why it cannot be completely imported into the law, because the law deals with twilight zones, but there is to any man who watches the progress of the things of law, sometimes a sort of heartbreak when you see going on so much cloudy thinking and no judge ever sat on the bench who did not, after listening to witness after witness speaking cloudily, using the English language inaccurately, using words that did not convey his idea, because the witness could not reach the right word, welcome the testimony of an engineer, trained to the minute, whose sentences come to a full stop at the right place, and who conveys to the Bench, not vaguely but exactly, the ideas he seeks to impart. There is a tremendous advantage in being trained to exact thinking. I wish I could express what I have in mind a little more accurately here to-night, but I have tried in this casual way to speak to you, and will wind up my speech with what I said at the beginning, that I am grateful to you for listening, and grateful also to Mr. Bennett for giving me the opportunity of being here. And I am glad to see here an engineer who helped make the word "Hartford" a very well known word in other quarters of the country, and that is Mr. Fred Ford; and his successor in office is a man who is also a member of your Society and an appointee of the City Government when I was in the City, Mr. Clark.

I thank you heartily for allowing me to talk to you in this casual way.

President Bennett: It gives me great pleasure to introduce Richard T. Higgins, Chairman of the Public Utilities Commission.

Mr. Higgins: I am here by virtue of the invitation of my distinguished friend, a member of this Society, Mr. Elwell. I came here with the understanding that my duty would be to use my ears and hold my tongue. I have used my ears to good advantage, and am fearful now I shall use my tongue to no advantage. I shall not talk very long, however.

I feel somewhat embarrassed in this distinguished gathering of engineers. My experience with engineers has been that they can lead one through the labyrinth of uncertainty, onto safe ground, but can with equal facility guide one into a haze of uncertainty and leave him there, to find his way out over a lot of blueprints.

I am not going to take much time, I have nothing prepared to say, but I do wish to express a few thoughts relative to the engineering profession. When we look around us and see the wonderful progress that has been made in the past, particularly within the past decade, we cannot but marvel at the accuracy and the skill of the engineering forces that brought that about, and when we stop to meditate upon these things, and then think what the immediate future has in store, we realize that we are living in an age of reconstruction, when the engineering forces, possibly more than any other combination of men in this country, are going to be called upon to construct for the future, it means, my friends, that there is resting upon your shoulders a duty to perform which I know with your ability, integrity and accuracy, you will perform in a workmanlike manner, to the benefit of yourselves, and for the benefit of this glorious nation which we all love so well.

It is not necessary for me to reiterate what you have just heard, but along the lines suggested by Judge Smith, I would like to mention one important thought, and that is that we, in all lines, whatever they may be, must view the honor of our profession as being far more important than the emoluments we may receive personally out of our daily toil. I wish we might ever bear that in mind, that while remuneration is necessary, in order to obtain a livelihood, yet the success of the undertaking we are engaged in, is of vitally more importance, not only to us, but to the community and to the country at large.

Just a few words in connection with public utilities. The rendition of a public service is not only for the benefit of the company rendering that service, but materially and vitally for the benefit of the public receiving that service, and if a company is undertaking to render such a service, it is absolutely necessary and essential that that company should have the coöperation and assistance of the public which it is trying to serve.

Whatever may have transpired in the past is gone, and I believe that to-day public service companies as a class are well officered and using every honest effort to render valuable public service to the different communities where they operate. But, to render that service it is necessary that one branch of the industry, the party receiving the service, should coöperate and assist in that endeavor.

There are three fundamental things connected with the rendition of public service, none of which can be omitted. First, capital, second, labor—and when I say labor I mean not only day labor but right along up the line including the executive officers—and, third, the public receiving the service. Unfortunately in the case of many utilities, particularly the transportation companies, only two of these elements are getting any return—labor is getting its return, whether it be the day laborer or the executive—and the public is getting a return, although it may not be getting the full return that it believes it is entitled to. The other element, capital, in many of our industries is getting no return. We cannot continue to have public utilities unless we make those utilities such that capital, which is essential, gets some return.

Marion, Ohio, Sept. 21, 1920.

Mr. James H. Herron,
1360 West Third Street,
Cleveland, Ohio.

My dear Mr. Herron:

Just a note to thank you for yours of September 15th, with the suggestions relative to the establishment of a Department of Public Works. I have not, of course, in the stress of matters here, had time to go into it, but I am more and more impressed with the merits of the proposition generally and disposed to look upon it with favor. When I have opportunity I will go into it with a studious purpose.

Very sincerely yours,

(Signed) Warren G. Harding.

THEODORE BOYDEN FORD.

*Mem. Conn. Soc. C. E. Died February 2, 1920.**

Theodore Boyden Ford, the son of Daniel Mill Ford and Harriet (Boyden) Ford, was born in Taunton, Mass., on September 4, 1868.

His parents moved to Bridgeport, Conn., when he was but an infant. He attended the Public Schools in that city and when leaving High School he secured employment in the City Engineer's office where he studied civil engineering, his tutor being Mr. Horace G. Schofield, then City Engineer, who, finding Mr. Ford well qualified for the position, later appointed him Assistant City Engineer. In 1900 a partnership was formed and for many years the two gentlemen conducted a general engineering business under the firm name of Schofield & Ford. Mr. Schofield died in 1917; Mr. Ford continued the business having as his principal assistant, Mr. Aubrey D. Fuller, who, at the present time, is conducting a general engineering business in Bridgeport under the original firm name.

In 1901, Mr. Ford organized The Burns Company, a general contracting firm, having as his associate partner Mr. George Burns. A large amount of construction work was done by The Burns Company, which company has always borne the reputation of doing work of the highest grade. Besides being Secretary and Treasurer of The Burns Company, Mr. Ford was a Trustee of the City Bank and a Director of the Bridgeport Storage Warehouse Company, and principal owner and Secretary of the Pequonnock Company.

Mr. Ford, as a Civil Engineer and Contractor, was connected with many construction jobs of magnitude in the State, including the large reservoirs for the Bridgeport Hydraulic Company, the Shelton Street Railway Company, that part of the Connecticut Railway & Lighting Company through the Housatonic Valley, the Westport and Saugatuck Street Railway Company and the water supply system for Bethel, Connecticut.

Mr. Ford took a deep interest in city and state affairs, but was in no sense an office seeker. His keen perception and clear judgment made him a good reader of character and his advice was often sought by those in authority when public positions of trust were to be filled, and who seldom, if ever, had good reasons to regret following his suggestions.

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* Memoir prepared by Charles C. Elwell.

In 1910, Mr. Ford was offered and accepted the position of Railroad Commissioner, which position he held until September, 1911, when the Public Utilities Commission was created and he was selected as the Engineer member, in which position he served a four year term and retired from the Commission on July 1, 1915.

Besides being an engineer of marked ability, Mr. Ford had other qualities which made him a valuable public official and contributed to the success of his many private undertakings.

Mr. Ford was a loyal friend and apparently derived more pleasure in doing for others than having favors bestowed on him.

Mr. Ford was made a member of the Connecticut Society of Civil Engineers on April 20, 1901.

He was made a member of the American Society of Civil Engineers in 1905.

He is survived by his widow Laura (Webb) Ford, to whom he was married September 4, 1909.

Mr. Ford's death occurred on February 2, 1920, following a brief illness, although his health had been impaired for several years.

WARREN WILLIAM UPSON.*

Mr. Warren William Upson died at Bennington, Vermont, September 2, 1918. His home was in Kensington, Conn., and he attended the public and high schools in New Britain, Conn.

Mr. Upson was graduated from the Yale Scientific School in the class of 1910. After leaving Yale he entered the employ of the H. Wales Lines Company, Meriden, and in 1912 he entered into a partnership with Mr. John Wise of Hartford under the firm name of Wise & Upson, which partnership was continued until his death.

Mr. Upson was affiliated with many fraternities, originally joining the Masons in New Britain in 1910 and later with the Masons of Hartford and Norwich, receiving his 32d degree in Norwich. Other fraternal organizatons with which he was affiliated are the following: Pythagoras Chapter, R. A. M.; Walcott Council, R. & S. M.; Washington Commandery, Knights Templar; Charter Oak Lodge of Perfection; Hartford Council, Princes of Jerusalem, Cyrus Goodell Chapter, Rose Croix, Connecticut Consistory, Sphinx Temple, A. A. O., U. M. S.

He was also a member of the University Club of Hartford, City Club of Hartford, Wethersfield Country Club, and of the College Fraternity Pi Gamma Delta; Associate Member, American Society of Civil Engineers, Centennial Lodge A. F. and A. M.; Kiwanis Club of Hartford.

Mr. Upson died at the age of thirty, leaving a wife and two boys, three years and two years respectively, and his mother, Mrs. Willis W. Upson.

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* Memoir prepared by George W. Mylchreest.

REPORT OF THE PROCEEDINGS

OF THE

THIRTY-SIXTH ANNUAL MEETING

OF THE

Connecticut Society of Civil Engineers

Annual meeting of the Connecticut Society of Civil Engineers, held in Charter Oak Hall, 685 Main Street, Hartford, Connnecticut, February 17 and 18, 1920.

The meeting was called to order about 10:40 A. M. on February 17 by President Charles J. Bennett. About 45 persons were present.

It was voted that the reading of the minutes of the last meeting be dispensed with, the minutes having been published.

Secretary Kellogg then read the report of the Board of Direction.

REPORT OF THE BOARD OF DIRECTION.

The first meeting of the Board of Direction was held in June at a luncheon at the Hotel Taft in New Haven. President Bennett entertained the party: J. Frederick Jackson, Leon F. Peck, Assistant Secretary W. Howard Sharp and Secretary H. J. Kellogg. Mr. Clarence Blakeslee was present as guest of the President. The main object of the meeting was to arrange for a Summer Outing and Mr. Blakeslee came to offer the hospitalities of Chas. W. Blakeslee & Sons, The Connecticut Light and Power Company and The J. A. P. Crisfield Company at Stevenson Dam. The latter company held the contract for the work which was sublet to Chas. W. Blakeslee & Sons. There was no quorum but it was decided to accept Mr. Blakeslee's offer.

A meeting of the Board was held during the Summer Outing at Stevenson Dam. It occurred while soup was being served at the luncheon, its purpose being to get signatures to the applications of three candidates for admission. It was the first meeting that was ever held to the accompaniment of jazz music by a brass band.

The Board met again at the University Club, Hartford, January 9. Present, Bennett, Dunham, Elwell, Cairns and Jackson, of the Board, Assistant Secretary W. Howard Sharp and the Secretary. It was voted to devote two days to the Annual Meeting and to hold it at Hartford. Arrangements left to the President. Resignations accepted: J. O. Platt, T. C. Atwood, Robert N. Green, Howard S. Porter, David Reichgott, Charles H. Nichols and Daniel E. Bradley. Two men were dropped and several voted another opportunity. The ballots for nominations showed the following results:

For President, Thomas A. Scott.

For First Vice-President, J. Frederick Jackson.

For Second Vice-President, Robert J. Ross.

For Secretary and Treasurer, Henry J. Kellogg.

For Member of Board of Direction none received the ten votes required. The Board, acting under Article IV, Section 2, of the Constitution, placed in nomination, Clarence M. Blair, Frederick L. Ford and Edward W. Bush, these members having received the highest votes.

The only death reported was that of Theodore B. Ford, who had been engaged in general civil engineering in Bridgeport and lived in Milford. Another death should have been reported last year, Warren W. Upson, Hartford. Notice came last spring. We could get no response from letters sent, so further action was put off until next year.

The last meeting was held in Hartford, at the office of the President in the State Capitol building. Sixty-three applications for membership were examined and endorsed, also one for promotion. Of the sixty-three applications, fifty-four were for active and nine for associate membership. Three applications were too late to appear on the notices that had been sent out but the Board recommended them for favorable action. The names are S. Leonard Root and Aubrey D. Fuller, active, and P. James Kelly, associate. The National Department of Public Works and the Super-Power Line, between Washington and Boston, were discussed and left for the meeting to handle on the two days following, having arranged that the subjects should be presented. It was the opinion of the Board that the recommendations of Mr. Leonard Metcalf on the National Public Works Department, presented at the Smoker at Hartford, should be endorsed by the Society and the same forwarded to the Congressional Committee the subject is before.

A long discussion was held on relations with other engineering societies. That matter will be presented at the meeting. The Board took no action on incorporation.

The $10.00 prize was to have been discussed at the Summer Meeting, but anyone present at that meeting knows there was no chance for such discussion.

Present, C. J. Bennett, C. C. Elwell, J. Frederick Jackson, L. F. Peck and the Secretary.

It was voted that the report be accepted and placed on file.

Mr. Kellogg, Secretary, then read the Secretary's report, which was accepted and ordered on file.

REPORT OF SECRETARY.

To the Officers and Members of the Connecticut Society of Civil Engineers:

Your Secretary respectfully submits the following report:

At the Annual Meeting, 1919, twenty-two names were added to the list, as shown by the Secretary's report given in the 1919 Report.

The meeting was the most successful in attendance, quality of papers and interest shown in the subjects presented. The visit to the "Hump" yard at Cedar Hill was enjoyed by a good sized party and should have been made by more of the members. The dinner, at the Hotel Garde, was one of the largest, probably the largest, ever held. We had 145 members and guests present. The speakers, Mayor FitzGerald, C. L. Bardo, General Manager of the New Haven Road, John K. Punderford, an ex-President of our Society, Vice President and General Manager of the Connecticut Company, James T. Moran, President of the Southern New England Telephone Company, and Richard T. Higgins, Chairman of the Public Utilities Commission, gave able and interesting addresses. President Dunham made an excellent toastmaster and he is to be congratulated on the success that attended the dinner and that marked his administration. The committee in charge of the meeting made good.

From the Annual Meeting the year was uneventful until the Board of Direction met in June and decided upon the place for the Summer Meeting. It was the first time that I appreciated fully what a large Society for a small state ours is. When the notices went out they bore an urgent request for reply by postal whether attendance was intended or not and an unusually large number of postals returned. Not enough, however.

The Summer Meeting, held on the Stevenson Dam on the Housatonic River, July 30, 1919, was the largest meeting we ever had, over 200 attended. The day was perfect in a season that had not been liberal with pleasant days. Naturally the first thing done, as members arrived, was to look over the work and the contractors had many guides to lead the groups over the structure and to answer questions. The guests came in automobiles, arriving at different times, but all had sufficient opportunity and aid in making the inspections. That over, they marched, led by a detail of the Foot Guard Band, down the river bank to the mess hall. A very short time was taken up with a little business, including the election to membership of three men. The luncheon was an excellent one, hearty enough to appease appetites sharpened by the tramp and climb. Then came the ball game on a better lot than one would expect to find in such country. It was a good game, enlivened by good music between innings, and won by New Haven. It was about fifty-fifty on ringers so neither side protested. Mr. R. J. Ross reported as follows:

HARTFORD, CONN., August 6, 1919.

Mr. H. J. Kellogg, Secretary
Connecticut Society of Civil Engineers
New Haven, Connecticut.

Dear Mr. Kellogg:

The 6-inning ball game at the Society meeting was won by New Haven, which team made 9 runs against 3 for Hartford.

The quoit tournament did not materialize although a few minutes were given to the game just before lunch.

We did manage to have a relay race between two picked-up teams, which relieved me of the necessity of giving away the pipes and tobacco which were provided for prizes.

The prizes for the quoit tournament I handed around to some hungry-looking fellows up on the ball field.

The prizes for the three-legged race, two ½-pound boxes of candy, I divided evenly; one box to the rear guard of Society members and one box to the stenographer in my office, upon whom I impose to get many letters out, which have no connection with the business of the city of Hartford, like those pertaining to the Connecticut Society of Civil Engineers.

The prize for the standing broad smile you now have, or should have, which, I believe. is as it should be, for you probably would have won it had the event been pulled off.

I wish we might have had more interest in the stunts, but I think everybody considered the meeting so good that athletics were superfluous.

Very truly yours,
R. J. Ross.
per S.

P. S.—There must have been one or two real baseball players present for someone copped both balls.

R. J. R.

After winning the standing broad spit, near Totoket Mountain, North Branford, and the standing broad smile. by default, at Stevenson, as above stated, your Secretary hereby declines to defend the titles but leaves them open for competition. The prize for the "spit" is lost (and I do not recall what it was) and the prize for the "smile," a lolly pop, was placed in the mouth of a real nice little girl, a family relative.

The next event of the year was a Smoker, held at Hartford, October 30, 1919. The attraction was Mr. Leonard Metcalf, of Metcalf & Eddy, Consulting Engineers. Boston. Mr. Metcalf presented the matter of a National Department of Public Works in an excellent address and a general discussion followed. The subject will, if possible, be brought up at this meeting. About fifty attended.

The last event of the year was the Smoker at New Haven, December 2, 1919. The subject for the evening was "A Super-Power Line from Washington to Boston," by William S. Murray, Consulting Engineer, New York City, and formerly Electrical Engineer, N. Y., N. H. & H. R. R. It was a proposition that was staggering in its boldness and immensity, at first, but became more easy to comprehend as it was explained by Mr. Murray. It is hoped that this subject may be discussed at this meeting.

Nineteen hundred copies of the Annual Report were printed. Shipments have been made of the number of copies in each case, as requested, to the Iowa Engineering Society, the Ohio Engineering Society, the Illinois Society of Civil Engineers, and the Indiana Engineering Society. Copies have been mailed to engineering publications, secretaries of other societies, libraries and other points, and more will follow. The late issuing of the book was chiefly the fault of your Secretary. I had some good reasons. Getting the advertisements, which has been my annual duty for seventeen years. is a job in itself; and with the work of compiling a book makes a heavy burden for the first time trying. My engineering duties happened to be the most of any year, but one, in twenty-seven years. Then the publishers got into a glut of work, and so it went. It is a question whether we will keep up our exchanges. We are now way ahead of them in numbers.

Eight resignations and two deaths, partly compensated for by the election of three members at the Summer Meeting, reduce the membership of 393, given by the Secretary a year ago, to 386. The list of members to be made, 60, if all elected, would bring the total to 446. Some late arrivals may be presented to the meeting for unanimous consent. A few names came before the Board of Direction as delinquents and were voted dropped if they did not pay up after another notice. One has paid and I expect to get others of them. One man resigned, but I overlooked his name and kept right on sending him notices; and he kept right on with his payments. So I look on him as a pretty good member yet.

My Freshman Year as Secretary gave me all I could do and I did not work to good advantage. I always had a good opinion of my predecessor and, at the end of a year, have an increased respect for his work.

The officers of the Society are a fine lot of men and it has been a pleasure to meet with them. Our President has worked faithfully and well. I am proud to think that he is one of the friends I can call by his first name.

Report of Treasurer read by Mr. Kellogg, accepted and ordered on file.

Report of Treasurer for the Year Ending February 1, 1920.

RECEIPTS.

Cash on hand February 11, 1919	$ 130.34
Received cash $48.25—$32.00 listed under dues received	16.25
Received from advertising, 1918	10.00
Received from advertising, 1919	47.00
Received from dinner tickets	340.00
Received from sale of pin	2.75
Received from back dues	56.00
Received from 1918 dues	236.00
Received from 1919 dues	1,000.00
Received from 1920 dues	172.00
Received from Hartford Smoker, October 31	41.75
Received from New Haven Smoker, December 2	45.00
Received from coupons	19.36
Received from rebate on check No. 7	2.00
Received from applications for membership	128.00
	$2,246.45

DISBURSEMENTS.

Annual meeting, February 18 and 19	$462.70
Safe deposit box	5.00
Typewriting	18.50
Victory Bond	100.00

Salary of Secretary and Treasurer	$200.00
New Haven Printing Co., printing, stationery and postage	218.98
Summer meeting, Stevenson dam	124.57
Stenographer, annual meeting	52.90
Smoker at Hartford, October 31	79.25
Smoker at New Haven, December 2	93.50
Rubber stamp	3.25
Post Office box	6.00
Telephone and telegraph	4.55
Traveling expenses	3.18
Freight and carting	20.76
The Tuttle, Morehouse & Taylor Co.	217.00
Postage	59.10
Overdraft	6.00
Cash in bank	571.12
	$2,246.45

Election of officers, Polls close at 11 o'clock. Tellers working on ballots. Election of new members.

Mr. Kellogg: I have the list here.

Mr. Bennett: Will the Secretary make a report on the action on new members?

Mr. Kellogg: At the meeting yesterday the Board of Direction acted on the list that was presented, 50 of them. (Reads list of applications for membership.)

Mr. Jackson: I understand those are the ones the Board of Direction recommended for active membership, whose names appear on that list. I move that the names as read—that the rules be suspended and the Secretary be instructed to cast one ballot for them for active membership in the Society. Voted.

Mr. Bennett: Were any associate members recommended?

Mr. Kellogg: One. Walter M. Jones.

It was moved that the rules be suspended; that the Secretary be instructed to cast one ballot for Walter M. Jones for transfer from associate membership.

Mr. Kellogg: Leonard Root and A. D. Fuller were passed on by the Board of Direction yesterday afternoon, but their names were not included in the list sent out.

Mr. Bennett: It is necessary to have unanimous consent for these men to be elected to membership.

Mr. Terry: A. D. Fuller is successor to Theodore B. Ford. Mr. Fuller has been in Mr. Ford's office for years. Mr. Root is Supervisor of Highways.

Mr. Kellogg: Both of them have good records on their applications.

It was voted that the Secretary cast one ballot for the election of those two members.

Mr. Kellogg: For associate members, Duggan, Duffy, Holly, Shaughnessy, Lathrop, Ince, Lane, Selner—and there is P. James Kelly, who got in late.

Mr. Jackson: I move the regular motion in regard to those whose names were received and printed upon the notices for the meeting.

Motion seconded, put to a vote, and carried.

Mr. Jackson: With reference to P. James Kelly, I move the Secretary cast one ballot, for his election.

Voted.

Recess.

Mr. Kellogg spoke of Society pins, prices for them, and taking orders for them.

Report of tellers: President, Thomas A. Scott, 142; Clarence Blair, 1. First Vice President, J. F. Jackson, 131; A. L. Donnelly, 1; J. C. Tracy, 1; Blair, 2. Second Vice President, R. J. Ross, 141. Secretary and Treasurer, H. J. Kellogg, 143. Directors, F. L. Ford, 77; Blair, 39; Edward Bush, 26.

Mr. Bennett: I suppose it is in order for the President to declare the following elected: Scott, President; Jackson, First Vice President; Ross, Second Vice President; Kellogg, Secretary and Treasurer; Ford, member of Board of Direction. Next in order is the address of the President.

(Mr. Bennett read his address, as President.)

(Presentation to Society of gavel made of foundation timbers of bridge at Westport.)

Mr. F. L. Ford: I want to congratulate the Society on the splendid address of Mr. Bennett, and upon the success of his administration. We have never taken in so many members as this year, and I do not recall taking in such high lights as the President of the New York, New Haven and Hartford Railroad, and the President of The Connecticut Company. I move the acceptance of the President's address, and that it be placed on file and included in the annual report.

Motion seconded, put to vote, and carried.

Mr. Bennett: The next in order of business is miscellaneous business.

Mr. Ford: There is one matter which may have been overlooked and should receive the unanimous consent of the Society. Last summer this Society admitted to associate membership Charles E. Price, who, many of you know, is the shining light of the Portland Cement Association and well known to engineers in this state. I think at that time it was a mistake to elect Mr. Price to associate membership, because of his active engineering work with the Board of Water Supply of New York City, and the construction of the Pennsylvania tubes under the Hudson River. I would like to ask the unanimous consent of the association and move that Mr. Charles E. Price be transferred from associate to active membership in this Society.

Motion seconded.

Mr. Bennett: Mr. Price wrote me a letter, asking to be transferred from the grade of associate to that of active member, and through oversight on my part the letter was not presented to the Board of Direction.

So unanimous consent on his proposition will relieve me of some embarrassment. Is there any discussion on this motion? (None.)

Motion put to a vote and carried unanimously, and the Secretary instructed to place the name of Mr. Price on the list of active members.

Mr. Ford: For the first time in years, during this past year, I have had opportuniy to realize and appreciate the duties of the Secretary of this Society. I believe this Society, with a membership of nearly 500, can afford to pay its Secretary more than $200 a year, and I move that the Secretary of this Society for the year 1920 be paid $400 per annum instead of $200.

Mr. Bunce: I had the honor at one time of increasing the salary of the Secretary, which then was regarded as, possibly, not a fair remuneration, but a decent advance over what it had been. So I now take great pleasure in seconding the motion.

Motion put to a vote and carried. The Treasurer was instructed to pay the Secretary $400 a year.

Mr. Kellogg: Gentlemen, I thank you.

Mr. Ford: Are there any recommendations in the annual address of the President which require specific action?

Mr. Bennett: I made several recommendations.

Mr. Jackson: The President recommended in his address, and it has been published in the notices for the meeting, that at this time there would be brought up for discussion, the question of the establishment of a National Department of Public Works. Many of you will recall, at the smoker here in Hartford, the interesting address given by Mr. Metcalf of Boston upon this subject, and those who were present at that time no doubt are fully aware of what this National Department of Public Works proposes to do. For the benefit of those who were not present at that meeting, I will try to outline in part what is proposed by the establishment of this department.

In the first place it proposes to change the name of the present Department of the Interior to the National Department of Public Works, and establish a Secretary of Public Works who would be a cabinet officer and who would have under him four assistant secretaries. With the exception of one other country, the United States stands alone as not having a department of this character. The need of such a department is apparent to anyone who has given even superficial examination to present conditions. At present the engineering work is divided among various and numerous departments, all doing more or less the same class of work, duplicating effort and making for inefficiency. There are twelve different bureaus of the Federal government making surveys. There are twenty-four different bureaus carrying on chemical investigations independently of one another. Twenty-nine bureaus engaged in some form of construction work without any correlation between them. The present arrangement of doing work and the responsibility of cabinet officers requires in one department alone, taking the Treasury Department for illustration, that the head of that department, to properly administer the affairs of the department, would need to be a banker, an architect, a trained insurance man, a doctor of medicine. The possibility of getting these different qualities in one man, and the possibility of any one man being able to administer the different bureaus, is manifestly absurd.

This campaign was started, as near as I can gather from information given by Mr. Metcalf, about forty years ago, and futile efforts have been made at various times since then to endeavor to coördinate the engineering opinion throughout the country so as to bring about this very necessary work, but up to within the last three years the efforts to accomplish it have not been coördinated. It was largely through the work of the Engineering Council that the present movement was started, and it has now progressed to such a point that reports from those in charge of this campaign are that things look very encouraging, and that the time is ripe for maximum effort to be exerted.

This proposed readjustment is to be accomplished by the passage of what is called the Jones-Reeves bill, and the Engineering Council with the funds they have had, have been working along the line of getting all the different bodies which are interested in engineering and allied lines, moulded into one working unit that could enlist not only those who are directly interested in engineering work throughout the country, but also those indirectly interested in it, say those allied lines which commercially come in contact with engineering work, and chambers of commerce which are naturally interested in seeing the government function efficiently and economically.

Our information is that the time is now ripe, and that maximum effort should be made by engineers, if this thing is going to be put across. It also requires money. The funds that the Engineering Council had to carry on this work are practically exhausted. The work is waiting for funds. The amount they estimate will be required to carry on the work is $100,000. Connecticut's share of that is $1,100. That $1,100 is supposed to be distributed between architects, mechanical engineers, civil engineers, electrical engineers, and other allied branches. At a rough guess I would say the proportion of the Connecticut Society of Civil Engineers which they might be expected to raise, would be about $300. This is our opportunity to put the engineering profession to the fore. Will we fail? At the most it may be a matter of one dollar from each man in this Society. I think the Connecticut Society of Civil Engineers has always met its responsibilities, and I do not expect it will fail at this time. I would like to offer the following resolution:

WHEREAS, The need of coördination in the various Government Bureaus directing engineering work has long been recognized; and

WHEREAS, The Jones-Reeves bill creating a National Department of Public Works affects such a coördination and will conduce to efficiency and economy in the construction and operation of public works, therefore be it

Resolved, That the Connecticut Society of Civil Engineers in annual convention assembled and voicing the opinion of its 450 members, does heartily endorse Senate bill 2232 creating said department; and be it further

Resolved, That we urge our Senators and Representatives to untiring efforts to secure the early passage of this bill.

I offer that resolution and move its adoption.

Mr. Bennett: Is there any discussion?

Mr. Terry: How many have read the Jones-Reeves bill?

Mr. Jackson: I have read part of it.

Mr. Terry: I have received a good deal of literature on this subject. The points advanced in this literature I agree with in the main. I do not know what the bill itself is; I have not seen it. This resolution asks us to endorse that particular bill. I think we should think carefully about it. The coördination of effort in a public works department in general principle is certainly all right.

Mr. Ford: As a member of a special committee of which our President is chairman, I was delegated to check up this matter with the New Haven Chamber of Commerce. I would like to read the action taken by that Chamber. This is a letter addressed to me, dated February 6, 1920:

Dear Mr. Ford:

At a meeting of the Chamber of Commerce held July 28 you presented for consideration the suggestion that a department of public works be created by Federal statute. The Chamber of Commerce, acting upon that suggestion to bring the matter to the attention of the Chamber of Commerce of the United States, desires to have the matter taken up as a national proposition in the form of a referendum to all constituent members of approximately 800 organizations throughout the United States. This will be done in the near future.

I am in favor of the passage of the resolution or of doing anything to promote this splendid work, that this Society can do consistently.

Mr. Bennett: As chairman of the state committee appointed by the national organization for the furtherance of this project, I have communicated with two or three organizations, the chief of which is the Manufacturers' Association of Connecticut. The President of that Association has written me, stating that he will do everything in his power to put this movement forward, and also has expressed himself in favor of this movement before the national manufacturers' association, which has taken action similar to that taken by the Chamber of Commerce of the United States.

Mr. Bunce: I wonder if we realize in any measure the great amount of faith which would be necessary on our part for the passage of such a bill? We ought to consider, I think, the tremendous opposition of the various departments of the government in Washington to any curtailment of the powers they now have. Having been connected with the government, years ago, I had opportunity to see in a small degree the working of such interior feelings and operations, as opposed to any changes. It seems to me we need about as much faith as my little grandson had yesterday. Having disposed of the valentine fever, he brought to me a little paper basket, and said, "Grandpa, I am getting ready for May day." I looked out of the window and said, "I wish I had your faith."

Mr. Kellogg: I wish to say that whatever we do now in presenting this resolution, and considering similar action taken in all parts of this country, centering upon the representatives in Washington, becoming more or less public, even if it fails now, it may open up the subject and put the general public alive to it sufficiently so it may be able to take a stronger stand next year. We can at least plant some seed now. Ten years ago I don't suppose many of those in this hall would have imagined that prohibition would have gone through. If Bryan and Rockefeller can put prohibition over on this country, there is a chance for us in this thing.

(The resolution was then put to a vote and passed.)

(It was suggested that the Secretary send the resolution to the Senators and Congressmen by mail.)

Mr. Buck: In connection with this resolution, I think it a good suggestion that individual members of this Society who are interested in this, write to their Congressman. Many times twenty individual letters from twenty persons will have more effect on a Congressman than one resolution from a society of 200 members.

Mr. Kellogg: To whom should this be addressed?

Mr. Bennett: I think to the different Representatives and Senators. Is there any further miscellaneous business?

Mr. Terry: Mr. Jackson brought up the need of money by the Engineering Council in this work. The resolution carries no money with it. I don't know what can be done except to urge those in favor of the resolution to forward a little money to the Council to help the work along.

Mr. Elwell: I wish to say a word in relation to the American Society of Civil Engineers, and particularly the state organization or branch of that Association which was formed here some two or three years ago. The American Society of Civil Engineers, of which I have been a member for the past thirty years, and before I knew there was the Connecticut Society of Civil Engineers, has been in existence since 1852. I have the honor at the present time of being the Director representing the New England section, and I think it would be appropriate for me to say a few words concerning the activities of the American Society at this time.

The Development Committee of the Society, which was appointed some time ago, has just made a report concerning state associations similar to ours, and in all probability if the recommendations of that committee are adopted, the Directors and officers will hereafter be elected by the different districts.

The Connecticut Section of the American Society of Civil Engineers has been holding occasional meetings for several years, and the question has been asked whether we should invite the members of the Connecticut Society of Civil Engineers to those meetings, but the matter has not been definitely settled. Things have been said recently which would indicate that some of the members of this Society feel they are being slighted because they are not asked to the meetings to which I refer. You have no reason for such feeling, any more than a Free Mason should feel slighted because he is not invited to a Royal Arch Chapter or a Knights Templar Commandery.

The American Society of Civil Engineers is a national organization that stands for big things. There is no reason why engineers who are eligible should not become members of it.

I wish we could, on social occasions, all get together. I am not so sure but it is a question for the Connecticut Society to take up. We are up in the air as to just what to do, but I am going to make a motion which may possibly settle this whole question. I move that a committee, consisting of three members of this Society, be appointed by the President to confer with the Connecticut Branch of the American Society of Civil Engineers, with a view to forming closer relationships between the two societies, and that committee I should say might report at the next summer meeting or some future meeting.

(Motion seconded, put to a vote, and carried.)

MR. BENNETT: The Chair will take under consideration the appointment of the committee.

MR. CLARK: On that motion just passed at the instance of Mr. Elwell, I note his suggestion, which I assume is not part of his motion, that the matter might be considered at next summer's meeting. Isn't that deferring it unduly? I move that the matter be referred to the Board of Direction of the Connecticut Society, with a view to getting earlier consideration of it.

MR. BENNETT: It is difficult to get the members of the Board of Direction together for a meeting. May I suggest that we might have another smoker this winter, at which the matter might be considered? You have heard Mr. Clark's motion; is it seconded? (Motion seconded.) That this matter be referred to the Board of Direction to be considered.

MR. HARTE: I take it that the committee is to take action and then refer the matter to the Board of Direction, to expedite the matter. I think this question touches one of the points in which the engineering profession is weak. We do not get together enough, among ourselves and with the other engineering organizations. The engineering profession as a whole is not taking its proper place in the world because it holds too much to the old idea of the student shut away in his study. It seems to me anything we can do which will tend to bring our own closely related bodies closer, and get us more in touch with the general outside world, should be expedited in every way.

MR. ELWELL: I heartily endorse what Mr. Harte says. It seems to me that this committee which you are to appoint, could confer with the Board of Direction, and the President of the American Society could appoint a committee to confer with the committee of this Society, and sit down, talk it over, and report something tangible upon which to act. You can't do it in a body like this.

MR. SAVILLE: I heartily endorse Mr. Elwell's stand, also Mr. Harte's. Mr. Clark has expressed an opinion that we should bring the thing more to a head. I am sure, speaking not only for myself, but in so far as I represent the Connecticut Branch of the American Society of Civil Engineers, I am quite sure that every one of that membership would welcome such a chance as Mr. Elwell has opened up. There will be a meeting of the Connecticut Branch within two weeks. I will personally take pleasure in bringing up this matter at that time, and suggest that a committee be appointed, if that is agreeable to the Connecticut Society of Civil Engineers, that a committee be appointed by the American Society branch to meet with the Connecticut Society's committee and formulate something that will bring both societies into closer touch both in the matter of engineering, and social activities.

Mr. Bennett: If a committee is appointed by this Society, will that committee be welcome at your meeting, Mr. Saville?

Mr. Saville: Yes, sir. The next meeting will be in New Haven at the Graduates Club. I presume on the 28th day of February this month. Everyone will welcome them if they will only come.

Mr. Elwell: If they will furnish the names, I presume notice will be sent to the members of this committee, so it will be understood.

Mr. Kellogg: Don't you think it would be just as well if the Secretary went along, too?

Mr. Bennett: Yes, sir, I do.

Mr. Elwell: I would like to hear Mr. Clark's motion read. (Motion read.) I do not see that Mr. Clark's motion is necessary—if he is willing to withdraw it—I believe this thing will be fixed up all right, without such a motion. If you are going to appoint a committee of this association to meet with the Board of Directors on the 28th at New Haven, at that time the matter can be discussed directly between our committee and that committee which Mr. Saville will appoint, or his whole Board. It strikes me that is just as soon as it can be taken care of. The question of the summer meeting was only a suggestion. It was not part of my motion.

Mr. Dunham: As I remember our constitution, it is within the province of this Society to call a special meeting at the request of ten members. Whether or not these smokers we have been having were special meetings in that sense of the word, I don't know, but in order to get this thing started, it seems to me that this committee might make a report to a special meeting in the nature of a smoker, or rather, to get it before all of the members, two special meetings, one in Hartford and the other in New Haven, in the form of smokers, in the near future. That will get quicker action than to defer it to the summer meeting. I think the American Society members are very anxious to be invited by the Connecticut Society members to join in with them.

Mr. Bennett: You have heard Mr. Clark's motion. All in favor say aye. Those opposed, no. In the opinion of the Chair, the noes have it. The Chair declares the motion lost.

Mr. Harte: I suggest it might be well, if we have smokers or other gatherings, to invite to them members of other engineering societies. If in that way we could get better relations between societies, it would be most desirable.

Mr. Buck: I think Mr. Dunham's suggestion is excellent. I move that the incoming President be requested to organize a smoker in Hartford or vicinity, for the month of March and a smoker in New Haven or vicinity, or some other part of the state, for the month of April.

(Motion seconded, put to a vote, and carried.)

Mr. Harte: I take it that that vote, being the action of at least ten members of the Society, serves to constitute those smokers as special meetings, or does the motion require a specific statement that they are special meetings?

Mr. Bennett: I should think they would be constituted meetings of the Society.

Mr. Dunham: May I ask the Secretary to read that section of the constitution which relates to special meetings.

Mr. Bennett: The clause reads as follows:

> In addition to the regular annual meeting, the Society shall hold at least one other general meeting, and may hold such other meetings . . . as the Board of Direction may decide to call.
> Special meetings may be called by the President . . . ten days before such meeting. Special meetings shall be called at the request of ten members.

Mr. Dunham: Does that mean the written application of ten members?

Mr. Bennett: Yes.

Mr. Saville: I wonder if now is the time to speak of the Super Power proposition. I hesitated, waiting to see if something was going to be said about it. It is a project that we should know about. Engineers who make their living by engineering in Connecticut are interested in this. It is a local matter. I move a committee of three be appointed by the Chair to consider this matter, reporting to the Board of Direction, perhaps, and see what steps can be taken to further the interests of Connecticut in this matter of the super power project.

(Motion seconded.)

Mr. Kellogg: I wish to call attention to what I received on this super power project. I will read it:

> On October 30 last we wrote you . . . on the above subject urging you as a Society to coöperate in supporting proposed legislation that will permit investigation of the super power project to start this year. Action vitally important to the membership of an organization like this can be most effective in convincing our legislators that this is good legislation, and many times without the small appropriation required. . . . This is a great opportunity for engineering organizations to do public service and become factors in national affairs . . . $250,000 to cover this work should be in the next sundry civil bill. . . . You should write personal letters to representatives in Congress. (Reprint from Journal of the A. I. E. E.)

There is an enclosure but I don't think you want me to read it, as it would take nearly three-quarters of an hour to do so. It is from Mr. Murray. A description of what will be done by this super power line. A considerable amount of saving in cost, and greater efficiency of power.

Mr. Bennett: Is there any further discussion on this motion for the appointment of this committee?

(Motion put to a vote and carried.)

Mr. Bennett: I will appoint Messrs. Saville, Rudd, and Crawley.

Mr. Harte: May I call attention to the fact that this question will be discussed in New York City on Thursday morning of this week at the United Engineering Building by the American Institute of Electrical Engineers. The Institute has extended an invitation to members of all engineering societies. They are welcome at the rooms of the Society and at these discussions.

Mr. Bennett: Any other miscellaneous business? Tickets for the dinner will be on sale this afternoon, here. Our Assistant Secretary is detained at home by illness. I have appointed Mr. Charles Price Assistant Secretary for this afternoon. Another thing. I would like a show of hands, indicating those present who are not members of the American Society of Civil Engineers. (About twenty hands raised.) The Chair will appoint on conference, if you please, with the American Society of Civil Engineers, Mr. Chandler, Mr. Saunders, and the Secretary. (Mr. Chandler later excused and appointment of someone in his stead taken under advisement.)

In my address I suggested the consideration of the relation of engineers and contractors. I don't like to force things too much, but that is an interesting subject to those of us who have to do with public work. If possible I would like to have a joint committee of contractors and engineers discuss some of the questions that arise from time to time.

Mr. Buck: I move the President be requested to appoint a committee of four, two contractors and two engineers, to consider the relations between engineers and contractors and report to the annual meeting.

(Motion seconded, put to a vote, and carried.)

Mr. Bennett: I will announce that committee later.

Mr. Turner: I move that the present President of this Society, Mr. Bennett, be one of the engineering members of this committee to consider the relation between contractors and engineers.

(Motion seconded, put to a vote, and carried.)

Mr. Dunham: Whether or not that motion could be so worded as to make Mr. Bennett a member *ex-officio* of that committee, making the total number five instead of four?

Mr. Bennett: Personally I would rather not serve on that committee as one of the four members, but would be glad to do anything I can.

Mr. Turner: I amend my motion so that our retiring President can act as an *ex-officio* member of that committee.

(Amended motion seconded, put to a vote, and carried.)

Mr. Kellogg: The matter of incorporation is still pending. Is there any further reason why we should incorporate? And the $10 prize business has been hanging fire for a long time.

Mr. Buck: I move the President be directed to appoint a committee of three to start the necessary action for incorporating this Society. I am surprised to learn that it was not incorporated long ago. It seems to me with the laws as they are, we most certainly ought to be incorporated.

(Motion seconded.)

Mr. Dunham: I think this same motion went through last year, and nothing has been done. I believe it was referred to the Board of Direction.

Mr. Kellogg: It was referred to the Board of Direction but nothing was done about it.

Mr. Buck: If I may restate my motion and amend it a little. My original intention was that this meeting create such a committee to incorporate the Society—not to consider the matter, but to get out the necessary papers and say to the Board of Direction, "Now, you sign here."

Mr. Dunham: Owing to the intracacies of the law, we ought to have a lawyer on that committee.

Mr. Bunce: I would like to know what is the special object, what special good it will do the Society to be incorporated? I suppose there are reasons, but I don't know them.

Mr. Bennett: The Chair is in doubt.

Mr. Buck: In the matter of holding property, it is better to be incorporated. We have five Liberty Bonds. If anyone should take those bonds, any one of us might individually be held for the property of the Society. If our funds should be dissipated before the payment of our printing bill, and the printing company wanted to bring suit, theoretically it would be possible for them to collect that entire printing bill from any one of us.

(Motion put to a vote and carried.)

Mr. Bennett: I appoint on the Incorporation Committee, Mr. Buck, Mr. Dunham, and Mr. Jackson.

Mr. Ferry: In regard to the Committee on Legislation, the Legislature meets next year before our next annual meeting. I don't know whether that committee still exists.

Mr. Kellogg: It was a continuing committee, last year.

Mr. Buck: Isn't it a standing committee? Isn't the incoming President charged with the duty of appointing that committee, under the constitution?

Mr. Kellogg: I think Mr. Buck was a member of that committee.

Mr. Buck: I have been a member. Mr. Bush and Mr. Ford were on that committee. I think that committee should be a new committee each year. I think it is provided for in the constitution, rather than depending upon a resolution at the annual meeting.

Mr. Bennett: The Chair is not informed as to whether there is a standing committee on legislation.

Mr. Dunham: It was so stated, a year ago, that that was a standing committee.

Mr. Bennett: There was no formal action taken, however.

Mr. Jackson: It is not clear to me just what the status of the Committee on Legislation is. It was supposed to be a standing committee, and was so printed in the previous reports except the last one, and was the only standing committee that I know of that remained of the many committees that were raised by the Society. At the conclusion of the report of Mr. Buck, it is not clear in my mind whether the committee was discharged. I think the impression is that they have finished their work, and that if there is to be a standing committee, a new one should be appointed by the incoming President.

Mr. Buck: That is the way the committee understood it.

Mr. Kellogg: You mean this previous committee is dead, now—Ford, Buck and Bush?

Mr. Jackson: That is my impression, that the committee finished its work, and it was their own idea that a new committee was to be appointed, but I don't know what their official standing is.

Mr. Bennett reads from the proceedings of last year:

> At the close of the discussion on the work of the Legislative Committee—
>
> Mr. Kellogg: I believe there is a vote that the committee be continued. Anyway, the committee is supposed to be continued, isn't that correct, Mr. Chairman?
>
> The President: I understand it is a continuing committee. I would like to ask Mr. Buck in regard to that resolution, if the committee could enlarge its membership upon its own initiative, if whether the membership is confined to the members appointed by the President?
>
> Mr. Buck: Mr. Chairman, in answer to that question, it should have the power to add to its membership.

Mr. Bennett: No action was taken last year.

Mr. Ford: I move that the President appoint a new Legislative Committee of three, to stand for two years, and that this committee be appointed by the incoming President.

(Motion seconded, put to a vote, and carried.)

Mr. Dunham: In view of certain things that happened at the summer meeting at the Stevenson dam during the dinner, I move, if it is in order, that the Secretary be instructed to read that voluminous report he just had, during the lunch hour. I think he should read it during luncheon.

(Upon motion the business meeting adjourned until two o'clock.)

(Meeting called to order about 2:15 p. m., February 17, by President Bennett. About 80 persons present.)

Mr. Bennett: We have an added attraction this afternoon in the form of moving pictures of the construction of concrete roads, presented by the H. L. Bond Company through the agency of Mr. Duffy. We are glad to have Mr. Duffy present these moving pictures, showing "The Lakewood Way" on a construction job in Chicago.

(Then followed the moving pictures of "The Lakewood Way," showing a concrete highway construction job near Chicago. Mr. Duffy thanked the Society for the opportunity of showing the pictures.)

Mr. Bennett: We are fortunate indeed in having Dr. Jewett here. It is a distinct compliment to the Society. Dr. Jewett is a man of national reputation. He is Chief Engineer of the Western Electric Company. He has served as Lieutenant-Colonel in the Signal Corps and was a member of the Anti-Submarine Board of the Navy. Dr. Jewett will speak to us on "Some War Time Developments in Electrical Communication and Allied Fields."

Mr. E. Irvine Rudd, Chief Engineer, Public Utilities Commission, State of Connecticut, read a paper concerning the elimination of railroad grade crossings.

Mr. Frank Bachman, Chemist and Engineer, Industrial Waste Department, Bureau of Sanitary Engineering, Connecticut State Department of Health, stated that the title of his paper was not correctly stated in the programme; that it should be "Some Limitations in the Precipitation of Trade Waste Waters." Mr. Bachman read his paper.

Papers printed on previous pages.

Next was an offering of several reels of moving pictures, "A Quarry in Action." Courtesy of New Haven Trap Rock Company. Mr. Clarence Blakeslee.

Mr. Bennett: The last paper on our programme is by Mr. James A. McElroy, City Engineer of Bridgeport, on the sewage disposal system of Bridgeport.

Mr. Bennett: There are one or two matters of business.

Committees on Necrology—Mr. C. C. Elwell for Theodore B. Ford; Mr. Buck for Mr. Upson.

Mr. Bush: Three years ago we took up the matter of a prize for the best paper. I don't know what has happened to it. I think some sort of an alibi was put forward, a year ago and two years ago.

Mr. Bennett: The matter was discussed informally yesterday, and left in statu quo, I suppose you would say.

Mr. Kellogg: Mr. Bush claims some kind of parentage to it, I think. In order to take care of the boy, we should finish this thing up. We had it before the Board of Direction, Monday, and there was some confusion about it. We bought two Liberty Bonds (?) to pay for it. The two Liberty Bonds fall a little short of paying the $10. I think we had better take it out of the treasury. I think the selection is by the Board of Direction.

Mr. Bush: I think, according to the motion, it was to be left to the vote of the Society, by letter ballot.

Mr. Kellogg: A letter ballot would cost $10. I think you had better leave it to the Board of Direction.

Mr. Bush: I move it be left with the Board of Direction, with power. That is, the matter of the prize.

It was so voted.

Mr. Ford: I move that this Society extend a vote of thanks to such individuals, clubs, or corporations, as have extended courtesies to this Society during this Annual Convention here in Hartford, and leave it to the discretion of the incoming President and the Secretary, to determine who such persons are, and extend them such a vote.

It was so voted.

Mr. Trowbridge: Referring to Mr. Jackson's remarks of yesterday concerning a National Department of Public Works and the support which this Society ought to give such a project, I think that unintentionally this matter was somewhat sidetracked. I am wondering if it would be proper to take some definite action. There are more of us here to-day. Perhaps Mr. Jackson wil repeat a few words on the subject.

Mr. Kellogg: We have a resolution. (Reads it.)

Mr. Bennett: I think Mr. Trowbridge's difficulty is as to the money. Resolutions are of no great financial benefit.

Mr. Trowbridge: I think the Society took no recognition of Mr. Jackson's appeal as to what it was intended to do in the matter of financial support.

Mr. Kellogg: I suppose I will have to ask different members to subscribe.

Mr. Bennett: There is a Committee appointed by the National Organization, to cover Connecticut. Professor Swain of Massachusetts Institute of Technology is the Chairman of the New England Committee, and I am Chairman of the Connecticut Committee, which consists of about ten men from the civil engineers. We are empowered to add to that, three other men as we see fit. The Committee itself has financed, so far, all the printing and postage necessary for the production of these circulars that you people had, but has not made any appeal for money. I had hoped that this matter might be brought up at this time and some action taken by the Society. If the Society takes no action, the Committee itself will institute an aggressive campaign for money, so you can either take action now or wait for the campaign which we will have to start before long. So far, Connecticut's contribution to this matter has been $51, being $50 from one contracting firm I think in Hartford, and one dollar from an interested party unable to give more. If this goes through, we will be in the position of standing on the side of the road, watching the parade go by, then falling in behind and climbing on the band wagon. If it does not go through, we can say we were wise enough to keep out of it. Our New England Committee will institute a campaign to get money.

Mr. Ford: I think this meeting should back up in a financial way the resolution passed at yesterday's meeting. It will take money to put this thing across. I am somewhat pessimistic as to the outcome of it, but we want to put the Engineers of Connecticut on the map by going into this campaign in an aggressive way. I would like to inquire from our Treasurer what the condition of our balance is, and from the President what our proportion would be toward the $1100 required from Connecticut, and the proportion among the different organizations supposed to come in on this plan—Electrical Engineers, etc.

Mr. Kellogg: As I reported yesterday, we have about $900 in the bank, and nearly $1100 to come out of that. That is an incorrect statement, however, as we have $380 coming in from advertising, and also are liable to receive some $1100 in dues, which is an uncertain factor.

Mr. Bennett: The State of Connecticut is supposed to give $1100 toward this proposition. You can figure it out any way you see fit.

Mr. Bunce: Didn't you say our proportion would be $311?

Mr. Bennett: I do not think I made any such statement.

A Voice: I think Mr. Jackson said $300.

Mr. Bennett: I think it has been figured out that if we really got the money, we would have to get it from a certain group of men who were possibly able to give up a little money, and my snap guess at it would be about $2 per member. Ask for two, take what you get, say $400. If we start our active campaign for contributions, we would ask every man for $2.

Mr. Kellogg: Do you think we had better circularize the Society?

Mr. Bennett: I think the Committee should take care of that expense, of circularizing. I do not think that should be financed by this Society.

Mr. Kellogg: The circulars would cost, say $10, and stamped envelopes $12—call it $25 it would cost us to get that out through the mails.

Mr. Bennett: There will not be any difficulty in financing that, with the Committee we have. I would much rather have you make it a straight contribution and let us send it along as the contribution of the Society.

Mr. Bush: I move we appropriate $100 from the funds of the Society for the furtherance of this cause—$100 towards the campaign for the National Department of Public Works. I think the Connecticut Society of Civil Engineers should be on record as furthering this thing. Our state adjoins the salt water, and there is a good deal of public works construction on our borders. Perhaps we are more interested in this than some inland states, especially as to harbor work, etc., and certainly we should show our interest by a contribution.

Motion seconded, question put to a vote, and carried.

Mr. Kellogg: You are going on with this individual solicitation?

Mr. Bennett: I understand that is independent, and covers architects, electrical engineers, and others. Is there any further business to come before the meeting?

A Voice: The Society has just voted to contribute $100. If your Committee solicits $2 subscriptions among our members, won't that conflict? Won't the individual subscriptions by our different members go on record as a subscription from this Society?

Mr. Bennett: No, it will not, as I see it. This Committee is a part of the national organization, and it is our business to get all the money we can to help this thing. Whatever we collect in small or large subscriptions will be credited to the man who gave it. We will prepare a list of the men who contributed, and that list will be submitted with the money to the national organization in Washington. Each man's subscription will be listed. They have on the subscription list now about 3,000 names. Is there any further business? If not, a motion to adjourn is in order.

Upon motion, it was voted to adjourn the meeting.

The meeting adjourned at 12:50, noon, February 18, 1920.

STATE OF CONNECTICUT,
SECRETARY'S DEPARTMENT.

[SEAL]

HARTFORD, August 24, 1920.

Received of H. J. Kellogg Ten Dollars for organization fee of THE CONNECTICUT SOCIETY OF CIVIL ENGINEERS, INCORPORATED, under the laws relating to corporations.

$10.00 (Signed) E. KENNA, *for Secretary.*

STATE OF CONNECTICUT,
OFFICE OF THE SECRETARY.

HARTFORD, CONN., August 24, 1920.

Sir:—The articles of association of THE CONNECTICUT SOCIETY OF CIVIL ENGINEERS, INCORPORATED, of the town of New Haven has been this day received and placed on file for record in this office.

Fee for recording,	$1.00	
" " certified copy,	1.50	
	$2.50	Paid

Very respectfully yours,

(Signed) FREDERICK L. PERRY, *Secretary.*
By E. K.

Received for record, December 11, 1920, at 11 h, 49 m, A. M., and Recorded in New Haven Records of Corporations, Vol. 39, Page 137.

By JOHN E. DOUGHAN, *Town Clerk.*

State of Connecticut,
[SEAL] Office of the Secretary.

ARTICLES OF ASSOCIATION OF THE CONNECTICUT SOCIETY OF CIVIL ENGINEERS INCORPORATED.

Be it known, That we, the subscribers, do hereby associate ourselves as a body politic and corporate, pursuant to the statute laws of the state of Connecticut regulating the formation and organization of corporations without capital stock, and the following are our articles of association:

Article I.

The name of said corporation shall be The Connecticut Society of Civil Engineers, Incorporated.

Article II.

The purposes for which said corporation is formed are the following, to wit:—The professional improvement of its members; the encouragement of social intercourse among men of practical science and the advancement of engineering in its several branches, to wit:—Civil, Hydraulic, Naval, Sanitary, Mechanical, Electrical, Architectural, Mining, Geological, Metallurgical, and Chemical; the reading and discussion of papers, or the hearing of lectures on any of the above topics relating to engineering science, and the transaction of all business properly belonging to said society. To acquire, receive, buy, hold, mortgage, sell and convey real and personal property for the use and benefit of this corporation, or to carry out its work and purposes. To do such other and further things, not inconsistent with law, as shall promote the general well-being of the corporation, its members and the engineering profession in general.

Article III.

The said corporation is located in the town and county of New Haven and State of Connecticut.

Dated at New London, Connecticut, this 11th day of August, 1920.

T. A. Scott,
J. Frederick Jackson,
Leon F. Peck,
R. J. Ross,
Incorporators.

County of New London }
State of Connecticut } ss: August 11, A. D. 1920.

Then and there personally appeared T. A. Scott, J. Frederick Jackson, Leon F. Peck, and R. J. Ross, signers of the foregoing instrument and severally acknowledge the same to be their free act and deed, before me.

Reuben J. Brenner,
Notary Public.

Approved, August 24, 1920.
Frederick L. Perry, *Secretary,*
By Elmer H. Lounsbury.

CONSTITUTION.

ARTICLE I.

NAME AND OBJECT.

SECTION 1.—The name of this Society shall be THE CONNECTICUT SOCIETY OF CIVIL ENGINEERS, INCORPORATED.*

OBJECT.

SEC. 2.—The object of this Society shall be the professional improvement of its members; the encouragement of social intercourse among men of practical science, and the advancement of engineering in its several branches, to wit: Civil, hydraulic, naval, sanitary, mechanical, electrical, architectural, mining, geological, metallurgical, and chemical; the reading and discussion of papers, or to hear lectures on any of the above topics relating to engineering science, and the transaction of all business properly belonging to said Society.

ARTICLE II.

MEMBERSHIP.

SECTION 1.—The membership of this Society shall consist of Members, Honorary Members and Associate Members.

MEMBERS.

SEC. 2.—Members must be at least twenty-one years of age and have had two years' actual experience in some branch of engineering or surveying, or shall have been graduated from an engineering course in a college or university of recognized standing, and they only shall be entitled to vote or transact business for the Society.

HONORARY MEMBERS.

SEC. 3.—Honorary Members may be as many as the Society shall elect. They shall have no vote, nor shall they be eligible to hold office. They shall have the right to attend all public meetings and to enjoy such other privileges as the Society may see fit to grant, excepting, however, such Honorary Members as may be elected from *active membership*, when they shall retain their right to vote and to hold office.

ASSOCIATE MEMBERS.

SEC. 4.—Any person desiring to become associated with this Society, who is not eligible to active membership, may make application, and if said application receives a favorable report from the Board of Direction, it shall be acted upon by the Society at the next regular meeting, and if said candidate shall receive a majority of the votes cast he shall be declared elected as an Associate Member. Associate Members shall have no vote, nor shall they be eligible for any office.

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* Incorporated under the laws of the State of Connecticut 1920.

ARTICLE III.

OFFICERS AND THEIR DUTIES.

OFFICERS.

SECTION 1.—The officers of the Society shall be a President, two Vice Presidents, a Secretary and Treasurer, an Assistant Secretary, and four Directors, one of whom shall be the last living Ex-President.

ELECTION OF OFFICERS.

SEC. 2.—The officers, excepting the Assistant Secretary and the Director who is the last living Ex-President, shall be elected at the annual meeting, and shall hold their respective offices until the final adjournment of the meeting in which others are elected and qualified in their places.

PRESIDENT.

SEC. 3.—The President shall preside at all meetings when present. He shall be chairman of the Board of Direction, and of all standing committees, and shall appoint all special committees, unless otherwise ordered by a vote of the Society.

VICE PRESIDENTS.

SEC. 4.—In the absence or inability of the President to act, the Senior Vice President present shall perform his duties.

SECRETARY.

SEC. 5.—The Secretary shall attend all meetings of the Society, and the Board of Direction, and shall keep the minutes thereof. He shall conduct the general correspondence of the Society, receive communications addressed thereto, and present the same to the proper committees, officers, or meetings. He shall issue notices of all meetings, inform committees of their appointment, and officers and new members of their election. He shall notify all committees of coming meetings and prepare the matters for presentation. He shall keep a complete list of all members, with their addresses and dates of election. He shall publish the annual report. He shall perform such other duties pertaining to his office as may be imposed upon him by the Society or by the Board of Direction, and shall receive a salary to be fixed by the Society.

TREASURER.

SEC. 6.—The Treasurer shall keep the accounts, collect all the funds of the Society and shall deposit the same to the credit of the Society in such depository as may be designated by the Board of Direction. He shall pay all bills, when approved by the President or a majority of the Board of Direction. He shall keep book accounts of his receipts and expenditures, which shall at all times be open to the inspection of the Board. He shall make a duly audited itemized report to the annual meeting. He shall give bonds for the faithful performance of his duties, in such amounts and with such sureties as the Board of Direction may require, and he shall receive such remuneration as the Society may vote to him from time to time. The Board of Direction shall audit the Treasurer's accounts and books annually.

ASSISTANT SECRETARY.

SEC. 7.—The Assistant Secretary shall be appointed annually by the President, and his duties shall be such as would pertain to the office of executive secretary.

BOARD OF DIRECTION.

SEC. 8.—This Board shall consist of seven members: the last living ex-President, ex-officio; a President; a First and Second Vice President; and three Directors. The President and two Vice Presidents shall be elected annually to serve one year. One Director shall be elected each year to serve for three years, and he shall not be eligible for reelection to that office until one year has elapsed after his term of office has expired.

The President or one of the Vice Presidents shall preside at all meetings of the Board in the order of seniority. In the absence of all of these officers, a chairman *pro tem.* may be appointed for the meeting.

Four members shall constitute a quorum for the transaction of business.

ARTICLE IV.

ELECTIONS.

OFFICERS, WHEN ELECTED.

SECTION 1.—At each annual meeting the Society shall elect by ballot a President, two Vice Presidents, a Secretary and a Treasurer, to serve one year. At the annual meeting in 1916, a Director shall be elected to serve one year; at the annual meeting in 1917 three Directors shall be elected, one to serve one year, one to serve two years and one to serve three years. At each annual meeting after 1917 one Director shall be elected to serve three years.

NOMINATIONS, HOW MADE.

SEC. 2.—A nominating blank, containing a list of officers to be voted for, shall be sent by the Secretary to each member, at least sixty (60) days before the day of the annual meeting. The nominations for officers shall be returned to the Secretary in an envelope endorsed with the member's signature, within twenty-one (21) days from the date upon which the blanks were mailed to members, and shall be delivered by him, unopened, to the Board of Direction at a meeting to be held by them to canvass such nominations.

A member nominated for an office by as many as ten (10) other members may become a candidate for that office. If a member be nominated for more than one office, he shall be considered as having been nominated for that office for which he received the most nominating ballots.

If no member receives ten (10) nominating ballots for an office, or if for any reason there should be no candidate for an office, the Board of Direction shall nominate at least two candidates for that office.

All nominees for office shall be notified at once by the Secretary of their nomination and, unless the Secretary receives a prompt declination. it shall be assumed that they have accepted such nomination.

ELECTIONS, HOW CONDUCTED.

Sec. 3.—At least twenty-one (21) days before the annual meeting the Secretary shall send each member a ballot, containing the names (arranged alphabetically) of the candidates for each office. This shall be accompanied by an envelope addressed to the Secretary, with a blank space on the back for the signature of the member voting, also a blank envelope carrying no mark for recognition.

Each member shall signify his choice of candidates on the ballot and return it to the Secretary in two sealed envelopes; the inner one to be left entirely blank, and the outer one endorsed with signature of sender.

Ballots may be sent by mail to the Secretary or handed to him directly. The Secretary shall deliver the ballots, unopened, to the tellers appointed by the presiding officer.

The polls will close at eleven o'clock in the morning of the day of the regular annual business meeting of the Society.

MEMBERS IN ARREARS CANNOT VOTE.

Sec. 4.—It shall be the duty of the Treasurer to furnish the tellers with an alphabetical list of members in arrears for dues for two years or more, and no vote from a member so in arrears shall be counted. Ballots received from such members shall be returned to them unopened with a statement of the reason for such action.

PLURALITY ELECTS.

Sec. 5.—The candidate for each office receiving a plurality of the votes shall be declared elected. In case of a tie vote, the meeting shall proceed to vote by ballot for the candidates who are tied.

NOTIFICATION.

Sec. 6.—The Secretary shall officially notify in writing each officer of his election.

Officers so elected shall qualify and assume their duties immediately after the adjournment of the meeting at which they are elected, and shall hold office until their successors are duly elected and qualified.

VACANCIES.

Sec. 7.—Vacancies occurring for any cause in the list of officers shall be filled by the Board of Direction.

ELECTION OF MEMBERS.

Sec. 8.—Each application shall be announced on the notices for the next meeting after it is received, shall then be considered by the Board of Direction, and, if approved, shall be presented to the Society for ballot at a regular meeting. If a candidate receives a majority of the ballots, he shall be declared elected. In case of rejection, no minute shall be published, but the Secretary shall notify the applicant by letter.

APPLICATION FOR MEMBERSHIP.

Sec. 9.—All applications for membership or for transfer from one grade of membership to another, shall be made on a regular form, to be secured from the Secretary, and to be endorsed by three Members. This form shall contain, immediately over the signature of the applicant, a clause in which the applicant shall agree that if elected he will be governed in all Society matters by the Constitution and By-Laws, and will forward the interests of the Society at all times.

ARTICLE V.

MEETINGS.

ANNUAL MEETINGS.

Section 1.—There shall be a *regular annual meeting* held on the third Tuesday of February of each year, at such place as may be selected by the Board of Direction, of which due notice shall be given by the Secretary.

MEETINGS, HOW CALLED.

Sec. 2.—Special meetings may be called by the President and, when so called, notice of the meeting specifying the business thereof shall be mailed by the Secretary to the postoffice address of each member at least ten days before such meeting shall be held. Special meetings shall be called by the President on written application of any ten (10) members.

QUORUM.

Sec. 3.—Ten per cent. of the membership shall constitute a quorum for the transaction of ordinary business, except for the election of officers or for voting on amendments to the Constitution or By-Laws, which shall require fifteen per cent.

ARTICLE VI.

DUES.

Section 1.—The annual dues of members and associate members shall be four ($4.00) dollars per year, payable in advance at the annual meeting.

Members elected at any time of the year shall pay full dues for that year.

Sec. 2.—Honorary Members shall pay no annual dues.

SEC. 3.—The Board of Direction shall have power to remit dues when, in their opinion, it is for the best interest of the Society.

SEC. 4.—Active and associate members who have reached the age of seventy years and who have paid dues as such for twenty-five years shall be exempt from further dues. Active and associate members who have paid dues as such for thirty-five years shall be exempt from further dues.

ARTICLE VII.

DEPRIVATION OF MEMBERSHIP.

SECTION 1.—Any member whose dues shall remain unpaid for two (2) years shall be notified by the Treasurer, by sending by registered mail a bill for dues in arrears, on the face of which bill shall be printed the sections of the Constitution covering such cases. If the dues are not paid within thirty (30) days after such notification, the matter shall be presented to the Board of Direction, who shall have power to drop such member from the roll.

RESIGNATIONS.

SEC. 2.—Resignations must be submitted in writing to the Secretary, and may be accepted by the Board of Direction when all indebtedness to the Society has been discharged.

SEC. 3.—All charges against any member shall be investigated by the Board of Direction before being submitted to the Society.

Any member may be expelled for conduct which may be deemed prejudicial to the Society, by a two-thirds vote of the Members present at a business meeting; provided, that not less than fifteen (15) vote for expulsion, and that such member shall have had one month's notice of the charges preferred against him and of the time appointed for their consideration. All charges must fully set forth the offense or offenses alleged, and must be signed by the members preferring them. An attested copy must be furnished the accused, who shall be entitled to be present and to be heard in defense, in person or by attorney, at all meetings at which the charges are investigated, except during the time when a final vote is being taken.

ARTICLE VIII.

AMENDMENTS TO CONSTITUTION.

SECTION 1.—Proposed amendments to this Constitution must be presented in writing at a regular business meeting of the Society, and signed by at least three members. Amendments so presented shall be read at the meeting and a copy filed with the Secretary at the same time. At the meeting when presented the proposed amendments may be discussed and amended, and if approved by the meeting shall be submitted to a letter ballot by the Society at the next regular business meeting.

SEC. 2.—At any regular business meeting the amendments previously proposed, according to Section 1, may be voted upon by letter ballot.

These ballots shall be sent out with the call for the meeting and shall have the proposed amendment, together with the section of the present Constitution covering the point in question, printed upon the ballot. With the ballot shall also be sent an envelope directed to the Secretary and marked "Ballot on Amendment." The Secretary shall keep these letters unopened and present to the presiding officer all replies received up to the hour of closing the polls. Tellers shall be appointed by the presiding officer, who shall open and count all ballots. The result shall be announced at the meeting by the presiding officer. Two-thirds of the ballots cast will be necessary for the adoption of an amendment.

SEC. 3.—The Board of Direction is authorized to number the Articles and Sections of the Constitution and By-Laws to correspond with any changes that may be made.

BY-LAWS.

MEETINGS.

1. In addition to the regular annual meeting, as provided by the Constitution, the Society shall hold at least one other general meeting, and may hold such other meetings to listen to lectures or addresses, or to visit engineering works of interest, or of a purely social nature, as the Board of Direction may decide to call.

GENERAL ORDER OF BUSINESS AT ANNUAL MEETING.

2. The following general order of business shall be observed at annual meetings:

1. Presentation of, and action upon, minutes of last meeting.
2. Report of Board of Direction.
3. Report of Secretary.
4. Report of Treasurer.
5. Report of any Special Committees.
6. Election of new members.
7. Election of officers.
8. Address of President.
9. Miscellaneous business.
10. Papers, lectures or addresses.
11. Adjournment.

BUSINESS MEETING—ORDER.

3. The following general order shall be observed at Business Meetings:

1. Presentation of, and action upon, minutes of last meeting.
2. Miscellaneous announcements.
3. Stated business.
4. Adjournment.

4. Contributing Members under the old Constitution shall become Associate Members upon the adoption of the Revised Constitution.

5. Actual personal transportation expenses incurred by the Secretary in attending meetings shall be paid from the Society treasury, upon approval of the President or two members of the Board of Direction.

6. In the election of Honorary Members, a unanimous vote is necessary to elect.

7. The Society may at any time, duly named for the purpose, enact By-Laws for the future guidance, consonant with the Constitution. These By-Laws may be amended or repealed at any meeting, in the call for which meeting a copy of the proposed amendment or addition shall have been printed and sent to each member with the said notice.

PARLIAMENTARY RULES.

8. In all questions arising at any meeting, involving parliamentary rules, not provided for in these By-Laws, Roberts' Rules of Order shall be the governing authority.

VISITORS.

9. Visitors may be admitted to meetings under such rules as the meeting may prescribe.

10. All forms, such as blanks for application for membership, ballots for officers, ballots on amendments to Constitution or By-Laws, and other necessary blanks for the conduct of the business of the Society, shall be prepared by the Secretary and approved by the Board of Direction.

CHARTER MEMBERS OF THE SOCIETY.

HONORARY

Prof. John E. Clark	April, 1884
George H. Frost*	April, 1884

ACTIVE

E. P. Augur	April, 1884
C. H. Bunce	April, 1884
L. W. Burt	Jan. 13, 1885
C. E. Chandler	April, 1884
R. S. Hulbert	April, 1884
C. M. Jarvis	April, 1884
H. J. Kellogg	April, 1884
F. W. La Forge	Jan. 13, 1885
W. B. Palmer	Jan. 13, 1885
S. C. Pierson*	Jan. 13, 1885
A. W. Rice	April, 1884
William G. Smith	April, 1884
Nelson J. Welton*	April, 1884

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* Deceased.

Alphabetical List of Members.

With Addresses and Dates of Election.

Members are particularly requested to inform the Secretary at once of any changes in address.

HONORARY MEMBERS.

*AUGUR, Edwin P. (April, 1884), 59 Broad St., Middletown, Conn. P. O. Box 1027.

BRECKENRIDGE, Lester P. (Feb. 9, 1914), Director Mason Laboratory, Yale University, New Haven, Conn.

*BUNCE, Charles H. (April, 1884), Civil Engineer, P. O. Box 307, Hartford, Conn.

*BURT, Luther W. (Jan. 13, 1885), L. W. Burt & Son, Civil and Consulting Engineers, 721 Main St., Hartford, Conn., and *for mail,* 62 Imlay Sq., Hartford, Conn.

*CHANDLER, Charles E. (April, 1884), Chandler & Palmer, City Engineers, 161 Main St., Norwich, Conn.

CHITTENDEN, Prof. Russell H. (April 20, 1901), Dean of Sheffield Scientific School of Yale University, New Haven, Conn.

CLARK, John E. (April, 1884), Professor Mathematics, Emeritus, at Sheffield Scientific School, Yale University. Springfield, Mass.

FITZGERALD, Desmond (Jan. 8, 1901), Consulting Engineer, Brookline, Mass.

FULLER, William B. (Feb. 12, 1908), Consulting Engineer, 150 Nassau St., New York.

HADLEY, Dr. Arthur T. (April 20, 1901), President Yale University, New Haven, Conn.

HAUPT, Lewis M. (Feb. 12, 1907), Consulting Engineer, Cynwyd, Pa.

HAYNES, Edward C. (Jan. 14, 1890), 185 Plymouth Ave., Buffalo, N. Y.

*HULBERT, R. S. (April, 1884), Division Engineer, State Highway Department, 267 Rockwell St., Winsted, Conn.

*JARVIS, Charles M. (April, 1884), Federal Adding Machine Co., 50 East 42d St., New York, N. Y.

*KELLOGG, Henry J. (April, 1884), First Assistant City Engineer, New Haven, Conn.

*LA FORGE, Frederick W. (Jan. 13, 1885), U. S. Engineer, Fort H. G. Wright, New London, Conn.

LUTHER, Flavel S. Jr. (Feb. 9, 1904), former President Trinity College, Hartford, Conn.

*PALMER, William B. (Jan. 13, 1885), Palmer & Goodell, Civil Engineers and Surveyors, 211 State St., Bridgeport, Conn.

PETTEE, William E. (Jan. 10, 1899), Civil Engineer, Salisbury, Conn.

*RICE, Arthur W. (April, 1884), Retired, 29 Cedar St., New Britain, Conn.

SKINNER, Frank W. (Jan. 9, 1900), Editorial Staff of the Engineering Record, 22 Vesey St., New York.

*SMITH, William G. (April, 1884), Superintendent of Water Works, Waterbury, and *for mail,* 17 First Ave., Waterbury, Conn.

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* Made Honorary Members by vote taken Feb. 18, 1919.

MEMBERS.

ALDERSON, Algernon B. (Jan. 10, 1899), Civil Engineer, West Hartford, Conn.

ALLEN, George B. (Aug. [illegible]), Mill Architect and Civil Engineer, Fiske Rubber Co., Chicopee Falls, Mass.

AMRHYN, Gustave X. (Associate Member, Feb. 9, 1904), Superintendent of Parks, New Haven, Conn.

ANDREWS, Ralph J. (Feb. [illegible]), Civil Engineer, 49 Elmwood Ave., Waterbury, Conn.

ARNOLD, Walter F. (Aug. 8, 1917), Civil Engineer, H. Wales Lines Co., Meriden, and *for mail*, 105 Elm St., Meriden, Conn.

ARTHUR, George D. (Feb. 17, [illegible]), with William H. Arthur, Constructing Engineer, Stamford, Conn. Lives in Glenbrook, Conn.

ARTHUR, William H. (Feb. 17, [illegible]), Constructing and Engineering, Stamford, Conn. Lives in Glenbrook, Conn.

AUGUR, Edwin P. See "Honorary Members."

AYMAN, Nathan (Feb. 14, 1912), Assistant Engineer, 18 City Hall, New Haven, and *for mail*, 635 Congress Ave., New Haven, Conn.

AZHDERIAN, Reuben B. (Feb. 12, 1907), Assistant Engineer for Passaic Valley Sewerage Commissioners, Newark, and *for mail*, P. O. Box 117, Newark, N. J.

BACHMANN, Frank (July 3[illegible]), Chemist and Engineer, The Dorr Co., New York, N. Y.

BACKES, William J. (Feb. 8, 1910), Engineer, Maintenance of Way, N. Y., N. H. & H. R. R., New Haven, Conn.

BACON, Arthur W. (Feb. 9, 1904), Hall & Bacon, Civil Engineers, New Britain, Conn.

BALDWIN, Clarence B. (Feb. 17, 1920), Designer of Structural Steel, Berlin Construction Co., Berlin, Conn. Box Q, Kensington, Conn.

BANTA, D. Schuyler (Aug. 23, 1905), Civil Engineer, N. Y., N. H. & H. R. R., New Haven, and *for mail*, 217 Alden Ave., New Haven, Conn.

BARKER, Edward B. (Feb. 17, 1920), Engineering Force, West Hartford, Conn., and *for mail*, 1850 Boulevard, West Hartford, Conn.

BARKER, George P. (Aug. 13, 1913), Construction Engineer, H. Wales Lines Co., Meriden, and *for mail*, 163 Elm St., Meriden, Conn.

BARKER, William H. (Aug. 10, 1904), Expert in Patent Causes, 160 Broadway, New York.

BARNES, Niar (Feb. 10, 1914), 100 West Prospect St., New Haven, Conn.

BARNEY, Samuel E. (Jan. 9, 1900), Assistant Professor Civil Engineering, Sheffield Scientific School, Yale University, New Haven, Conn.

BARRY, W. Vincent (Feb. 11, 1913), Bridge Engineer, City Engineer's Office, New Haven, Conn.

BARTLETT, Frank R. (Aug. 17, 1909), Estimator, 26 Church St., Meriden, and *for mail*, 21 Lambert Ave., Meriden, Conn.

BEACH, C. Edward (Jan. 10, 1893), Civil Engineer, West Hartford, and *for mail*, Beach & Co., Hartford, Conn.

BEARD, Elmus Hipple (Feb. 18, 1919), Glenbrook P. O., Stamford, Conn.

BEARD, Theodore W. (Feb. 10, 1914), Construction Engineer, Chase Metal Works, Department 900, Waterville, and *for mail*, 71 Wooster St., Shelton, Conn.

BEARDSLEY, Allen M. (Feb. 18, 1919), 37 Beardsley Ave., Stratford, Conn.

BECKLEY, Chester A. (Aug. 11, 1920), Engineer, The T. A. Scott Co., Inc., New London, and *for mail*, 313 Pequot Ave., New London, Conn.

BEELER, Cresson L. (Feb. 19, 1918), Civil Engineer, N. Y., N. H. & H. R. R. Co., New Haven, Conn.

BEERS, Howard L. (Feb. 18, 1910), Eastern Engineering & Construction Co., Bridgeport, and [illegible], Stratford, Conn.

BEIN, Howard K. (Feb. 20, 1917), Engineering Department, U. S. Rubber Co., 500 Chapel St., New Haven, Conn.

BENNETT, Charles J. (Aug. 14, 1906), State Highway Commissioner, State Capitol, Hartford, Conn.

*BERNHARD, William E. (Feb. 15, 1916), Civil Engineer, Bridgeport, Conn.

BILDERBECK, George L. (Feb. 9, 1915), Bilderbeck & Langdon, Inc., Engineers and Architects, Barrows Bldg., New London, Conn.

BISHOP, Carlton T. (Aug. 13, 1913), Assistant Professor Structural Engineering, Sheffield Scientific School, Yale University, New Haven, and *for mail*, 284 Alden Ave., New Haven, Conn.

BLACK, Frank L. (Feb. 18, 1919), 1777 Noble Ave., Bridgeport, Conn.

BLAIR, Clarence M. (Aug. 10, 1904), Civil Engineer, A. B. Hill, 100 Crown St., New Haven, and *for mail*, 785 Edgewood Ave., New Haven, Conn.

BLAKESLEE, Albert D. (Aug. 8, 1916, Active, Feb. 19, 1918), Superintendent, C. W. Blakeslee & Sons, 58 Waverly St., New Haven, and *for mail*, 100 Dwight St., New Haven, Conn.

BLAKESLEE, Clarence (Jan. 9, 1900), Civil Engineer and Contractor, New Haven, Conn.

BLAKESLEE, Harold L. (Feb. 11, 1913), Superintendent, C. W. Blakeslee & Sons, 58 Waverly St., New Haven, and *for mail*, 596 George St., New Haven, Conn.

BLAKESLEE, Miles Grant (Feb. 19, 1918), Civil Engineer, C. W. Blakeslee & Sons, New Haven, Conn.

BLATCHLEY, William J. (Aug. 10, 1904), Treasurer, New Haven Engineering & Construction Co., 82 Church St., New Haven, Conn.

BLOOM, Clarence E. (Aug. 11, 1920), The J. H. Grozier Co., Hartford, and *for mail*, 469 Prospect Ave., Hartford, Conn.

BOLTON, William M. (Aug. 12, 1915), Civil Engineer, 18 City Hall, New Haven, and *for mail*, 401 Ellsworth Ave., New Haven, Conn.

BOWEN, J. Frank (Feb. 14, 1911), Superintendent Roads and Bridges and Town Engineer, South Manchester, Conn.

BOYLAN, James E. (Feb. 14, 1912), Engineering Department, Berlin Construction Co., Berlin, and *for mail*, Middletown, Conn.

BRADLEY, Edward F. (Feb. 9, 1915), Assistant Engineer, N. Y., N. H. & H. R. R., Willis Ave. and 132d St., New York City.

BRENNER, Reuben J. (Feb. 17, 1920), Assistant Engineer, City Engineer's Office, New Haven, Conn.

BREWER, Willard S. (Feb. 12, 1907), Division Engineer, City Engineer's Office, Hartford, and *for mail*, 25 Salem St., Hartford, Conn.

BRINSMADE, Daniel E. (April 20, 1901), Secretary and Assistant, Engineer Ousatonic Water Co., Shelton, and *for mail*, P. O. Box O, Derby, Conn.

BROSNAN, James T. (Aug. 7, 1918), 24 East Pearl St., New Haven, Conn.

BRODERICK, Clement M. (Feb. 17, 1920), Department of Engineering, Hartford, and *for mail* 15 Alden St., Hartford, Conn.

BROWN, Charles B. (Aug. 14, 1907), Professor of Railroad Engineering, University of Maine, Orono, Maine, and *for mail*, 1470 Chapel St., New Haven, Conn.

BROWN, Charles O. (Jan. 11, 1898), City Engineer, Danbury, Conn.

BROWN, Raymond J. (Feb. 15, 1916), Draftsman, The Foamite Firefoam Co., 200 Fifth Ave., New York City.

BUCK, Henry Robinson (Jan. 10, 1899), Prest. Ford, Buck & Sheldon, Consulting Engineers, 60 Prospect St., Hartford, Conn.

BUNCE, Charles E. See "Honorary Members."

BURGESS, Harold T. (Feb. 15, 1916), Civil Engineer, C. W. Blakeslee & Sons, 58 Waverly St., New Haven, and *for mail*, 24 Winthrop Terrace, Meriden, Conn.

BURGHARDT, Wallace W. (Feb. 13, 1906), Engineer, Canaan, Litchfield County, Conn.

*BURNS, William H. (Feb. 15, 1916), Civil Engineer, Farnumsville, Mass.

BURROS, Aaron (Feb. 19, 1918), Civil Engineer, Scovill Mfg. Co., Waterbury, Conn.

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* Mail returned. New address wanted.

BURT, Luther Harold (Aug. 14, 1900), Member L. W. Burt & Son, Civil and Consulting Engineers, 721 Main St., Hartford, Conn.

BURT, Luther W. See "Honorary Members."

BUSCHOR, Emil C. (Jan. 10, 1893), Assistant Engineer, Rapid Transit Subway Construction Co., 165 Broadway, New York, and *for mail*, 324 East Second Ave., Roselle, N. J.

BUSH, Edward W. (Jan. 10, 1899), Member State Board of Engineers having supervision over Dams and Reservoirs, 137 North Whitney St., Hartford, Conn.

BUSHELL, Arthur W. (Feb. 20, 1917), 309 Thayer Building, Norwich, Conn.

BUSHNELL, W. G. (Associate Member, Feb. 14, [illegible]), Electrical Engineer, Drawer [illegible], New Haven, Conn.

CADWELL, William H. (May 31, 1893), Civil Engineer, 213 Main St., New Britain, Conn.

CAHN, Alexander (Jan. 9, 1900), Civil Engineer, 839 Chapel St., New Haven, Conn.

CAIRNS, Robert A. (Aug. 29, 1890), Sanitary and Hydraulic Engineer and City Engineer, Waterbury, Conn.

CALDWELL, Fred E. (Feb. 17, 1920), Portland Cement Association, Chicago, Ill., and *for mail*, 67 Midland Ave., East Orange, N. J.

CAMPBELL, Carrol A. (Feb. 9, 1909), Director of Public Works, Middletown, Conn.

CANNON, Dana H. (Feb. 17, 1920), The J. H. Grozier Co., Hartford, and *for mail*, 906 Farmington Ave., West Hartford, Conn.

CARLISLE, H. E. (Jan. 9, 1900), Conduit Engineer, Southern New England Telephone Co., New Haven, Conn.

CARMALT, L. J. (Feb. 19, 1918), Engineering Department N. Y., N. H. & H. R. R., New Haven, Conn.

CARROLL, Charles D. (Feb. 14, 1911), Civil Engineer, Rivers, Harbors and Bridges Commission, New London, and *for mail*, 914 Bank St., New London, Conn.

CHAFFEE, Robert N. R. (Aug. 15, 1916), Civil Engineer, 35 South Miller St., Newburgh, N. Y., and *for mail*, 572 Broad St., Meriden, Conn.

CHANDLER, Charles E. See "Honorary Members."

CHAPMAN, Charles H. (Associate Member, Feb. 15, 1916), Manager Bridgeport Division, Connecticut Company, Bridgeport, and *for mail*, P. O. Box 1124, Waterbury, Conn.

CHASE, Charles F. (March 30, 1900), Chief Engineer, Berlin Construction Company, Berlin, and *for mail*, 241 West Main St., New Britain, Conn.

CLARK, Albert L. (Feb. 17, 1920), Draftsman, The Connecticut Co., 1631 Chapel St., New Haven, Conn.

CLARK, Herbert G. (July 18, 1899), Assistant Engineer, Department of Engineering, Hartford, and *for mail*, 4 West Clay St., Hartford, Conn.

CLARK, Jay H. F. (Feb. 17, 1920), Assistant Engineer, Connecticut Co., Madison, Conn.

CLARK, Roscoe N. (July 18, 1899), City Engineer, Hartford, Conn.

CLARK, William S. (July 14, 1890), Civil Engineer, Meriden, Conn.

CLARKE, Stanley N. (Aug. 16, 1911), Civil Engineer, Milford, Conn.

CLARKE, Vincent B. (Feb. 9, 1904), City Engineer, Ansonia, and *for mail*, 29 Jackson St., Ansonia, Conn. P. O. Box 582.

CLARKE, Waldo E. (Feb. 10, 1914), Resident Engineer, Rivers, Harbors, and Bridges Commission, New London, and *for mail*, 883 Montauk Ave., New London, Conn.

CLOSE, F. Perry (Feb. 19, 1918), Division Engineer, Municipal Building, Hartford, Conn.

CODAIRE, Alfred H. (Feb. 15, 1916), Collinsville, Conn.

COE, Frederick L. (Feb. 14, 1911), Assistant Engineer, City Engineer's Office, New Haven, Conn.

COE, Theodore I. (Jan. 9, 1900), Architect, Room 1100, Municipal Building, New York, and *for mail*, [illegible] West [illegible] St., New York, N. Y.

COGGESHALL, R. C. P. (June, 1887), Superintendent, Water Department, New Bedford, and *for mail*, 87 Court St., New Bedford, Mass.

COLE, Clinton L. (Feb. 9, 1904), Bliss & Cole, Appraisers, Connecticut Mutual Bldg., Hartford, Conn.

COLGAN, Alfred P. (Feb. 9, 1915), Civil Engineer, 44 Beacon St., Waterbury, Conn.

COLGAN, William R. (Feb. 9, 1915), Carlo Bianchi & Co., Inc., Framingham, Mass.

COLLINS, Edward T. (Feb. 11, 1913), U. S. Inspector, Engineering Department, New London, Conn.

COLLINS, Harry C. (July 18, 1899), Contracting Engineer, Berlin Construction Co., Springfield, Mass.

COMSTOCK, Lewis B. (Aug. 10, 1904), Civil Engineer, Comstock Block, East Hartford, Conn.

CONE, Joseph W. (Aug. 12, 1908), Civil Engineer, Greenwich, Conn.

CONNELLY, Harold M. (Feb. 17, 1920), Connecticut State Highway Commission, 769 Wethersfield Ave., Hartford, Conn.

CONNOR, M. A. (Feb. 14, 1911), Civil Engineering, 347 Wethersfield Ave., Hartford, Conn., or Connor & Poriss, General Contractors, 54 Church St., Hartford, Conn.

CRAIG, James (Feb. 18, 1919), Elmwood, Conn.

CRAM, Roy C. (Feb. 8, 1910), Assistant Engineer, Way and Structure, Brooklyn Rapid Transit Co., Brooklyn, and *for mail,* 412 Ocean Ave., Brooklyn, N. Y.

CRANDALL, George K. (Jan. 11, 1887), City Surveyor, 98 State St., New London, Conn.

CRAWLEY, Ernest W. (Feb. 14, 1912), U. S. Junior Engineer, U. S. Engineer's Office, New London, and *for mail,* 60 Vauxhall St., New London, Conn.

*CROSS, Robert Ellis (Feb. 15, 1916), Department of Engineering, Municipal Building, Hartford, and *for mail,* 315 Pearl St., Hartford, Conn.

CURTIS, Abner L. (Feb. 14, 1912), Assistant Engineer of Construction, N. Y., N. H. & H. R. R. Co., Pawtucket, R. I., and *for mail,* 86 Silver St., New Haven, Conn.

CURTIS, Charles D. (Aug. 17, 1909), Civil Engineer, 98 Church St., Naugatuck, Conn.

CURTIS, Fayette S. (Jan. 9, 1900), Vice President, N. Y., N. H. & H. R. R., Boston, Mass.

*CURTIS, George H. (Aug. 17, 1909), Freight Office, Willets Ave., New York City.

DABOLL, Ernest C. (Feb. 14, 1911), Civil Engineer, Groton, Conn.

DABOLL, Loren E. (Jan. 8, 1895), Civil Engineer, 98 State St., New London, and *for mail,* P. O. Box 356, New London, Conn.

DARGAN, Edward L. (Feb. 18, 1919), Connecticut State Highway Department, 446 Beechwood Ave., Bridgeport, Conn.

DARROW, Courtland R. (Jan. 8, 1895), Highway Commissioner, New London, Conn.

DAVIS, Arthur L. (July 18, 1899), Division Manager, American Bridge Co., 30 Church St., New York, N. Y.

DAVIS, Frank J. (Feb. 14, 1911), Superintendent, Ansonia Water Co., Ansonia, and *for mail,* 51 Franklin St., Ansonia, Conn.

DAVIS, Frederick A., Jr. (Aug. 11, 1920), Park Commissioner's Office, New Haven, Conn.

*DAVIS, Walter M. (Associate Member, Aug. 13, 1913), Merwin Ave., Woodmont, Conn.

DEGNAN, James F. (Associate Member, Feb. 17, 1920), Secretary, C. A. Sibley Co., Contracting Engineer, 902 Chapel St., New Haven, Conn.

DE MAY, Winfred W. (Feb. 17, 1920), City Engineer's Office, Hartford, Conn.

DEMING, Charles R. (Feb. 20, 1917), Chief Draftsman, Lockwood, Greene & Co., 245 State St., Boston, Mass., and *for mail,* 59 Ackers Ave., Brookline, Mass.

DEPEYSTER, Frederick (Sept. 3, 1891), General Manager, The Brainerd, Shaler & Hall Quarry Co., Portland, Conn.

DEYO, Solomon LeF. (Jan. 9, 1900), Chief Engineer, New York Rapid Transit Subway Construction Co., New York City, and *for mail,* 2100 5th Ave., New York City.

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* Mail returned. New address wanted.

DOANE, Royal B. (Feb. 20, 1917), Maple Hill, New Britain, Conn.

DOERR, John H. (Feb. [illegible]), Roadmaster, Connecticut Co., Waterbury, Conn.

DONAGHUE, Edward L. (Feb. 19, 1918), Civil Engineer, Department of Engineering, Hartford, Conn.

DONNELLY, Albert L. (Feb. 14, 1912), Assistant Engineer, Connecticut Company, New Haven, and *for mail*, 10 Lincoln St., New Haven, Conn.

DORRANCE, William T. (Feb. 17, 1920), Designing Engineer, N. Y., N. H. & H. R. R. Co., New Haven, Conn.

DU BRUEIL, J. M. (Aug. 2, 1919), 248 Whalley Ave., New Haven, Conn.

DUFFY, Joseph M. (Associate Member, Feb. 17, 1920), Waldo Bros. & Bond Co., Contractor's Equipment, 281 Congress St., Boston, or 92 Alban St., Boston, Mass.

DUNHAM, W. R., Jr. (Feb. 12, 1907), Engineer, Maintenance of Way, The Connecticut Co., New Haven, Conn.

DUNN, Herbert L. (Aug. 14, 1920), Civil Engineer, 172 Willetts Ave., New London, Conn.

EASTERBROOK, Frederick J. (March 30, 1900), Resident Engineer, American Brass Co., Waterbury, Conn. 82 York Sq., New Haven, Conn.

ECKLE, John N. (Feb. 9, 1915), Civil Engineer, 283 Union Ave., West Haven, Conn.

EDDY, Charles W. (Jan. 9, 1900), Assistant Engineer, Waterbury Water Supply, Thomaston, Conn.

ELLSWORTH, F. H. (March 30, 1900), Division Engineer, N. Y., N. H. & H. R. R. Co., New Haven, and *for mail*, 439 George St., New Haven, Conn.

ELTON, Herbert C. (Feb. 9, 1915), Civil Engineer, N. Y., N. H. & H. R. R. Co., General Offices, New Haven, and *for mail* 222 Maple St., New Haven, Conn.

ELWELL, Charles Clement (Feb. 8,. 1910), Public Utilities Commissioner, New Haven, and *for mail*, 71 College St., New Haven, Conn.

EULA, Dominick B. (Feb. 18, 1919), Connecticut State Highway Department, 32 Taylor Ave., South Norwalk, Conn.

EVANS, Lafayette (Feb. 14, 1911), Second Assistant City Engineer, Bridgeport, Conn.

EVERIT, Edward H. (Oct. 11, 1902), Chief Engineer, Southern New England Telephone Co., New Haven, Conn.

FARNHAM, Charles S. (Feb. 9, 1904), Assistant Professor Civil Engineering, Sheffield Scientific School, New Haven, and *for mail*, 211 Norton St., New Haven, Conn.

***FENELON**, Earl Stanley (Feb. 15, 1916), Civil Engineer and General Foreman, Foundation Co., New York, N. Y., and *for mail*, Box 736, Bangor, Maine.

FERRY, Charles A. (Jan. 9, 1900), Consulting Engineer, 82 Church St., New Haven, Conn.

FIEN, Aaron (Feb. 17, 1920), City Engineer's Office, Hartford, Conn.

FONES, William A. (Associate Member, Aug. 11, 1920), President, The T. A. Scott Co., Inc., New London, Conn.

FORD, Frederick L. (Jan. 12, 1897), Vice President and Manager, The Connecticut National Pavements, Inc., 173 Orange St., New Haven, Conn.

FRANCIS, George S. (Feb. 19, 1918), Civil Engineer, Department of Engineering, and *for mail*, Wethersfield, Conn.

FRECH, John L. (Feb. 20, 1917), Civil Engineer, N. Y., N. H. & H. R. R., and *for mail*, 17 Smith St., West Haven, Conn.

FRENCH, Joseph H. (Feb. 17, 1920), Electrical Engineer, The Eastern Power Co., Norwich, Conn.

FULLER, Aubrey D. (Feb. 17, 1920), Scofield & Ford, 952 Main St., Bridgeport, Conn.

GADD, Robert F. (Feb. 17, 1920), Estimator, Engineer, Salesman and General Manager, Levering & Garrigues Co., Hartford, and *for mail*, 76 Kenyon St., Hartford, Conn.

GAGEL, Edward (Jan. 9, 1900), Chief Engineer, N. Y., N. H. & H. R. R. Co., New Haven, Conn.

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* Mail returned. New address wanted.

GAILOR, Chester F. (Feb. 15, 1916), Consulting Engineer, 30 Church St., New York, N. Y.

GAILOR, D. Floyd (Feb. 11, 1913), The Connecticut Co., New Haven, and *for mail,* 1184 Chapel St., New Haven, Conn.

GARDNER, Robert S. (Aug. 11, 1920), District Salvage Officer during the late war, rank Lieut. Commander, U. S. N. R. F. Wreckmaster, The T. A. Scott Co., 261 Pequot Ave., New London, Conn.

GEER, E. Selden, Jr. (Feb. 15, 1916), Safety Engineer, Travelers Insurance Co., Hartford, and *for mail,* 64 Niles St., Hartford, Conn.

*GEER, Henry W. (Aug. 12, 1915), Civil Engineer, Middletown, Conn.

GILBERT, William T. (Feb. 17, 1920), Civil Engineer, 501 George St., New Haven, Conn.

GINGOTT, Louis Everett (Feb. 18, 1919), P. O. Box 117, Rockland, R. I.

GLADDING, Henry H. (Jan. 9, 1900), Assistant City Engineer, New Haven, Conn.

GLYNN, John C. (Aug. 12, 1915), Civil Engineer, 420 Newport News Ave., Hampton, Va.

GOODELL, Paul G. (Feb. 19, 1918), Palmer & Goodell, 212 State St., Bridgeport, Conn., or 86 Warwick Ave., Stratford, Conn.

GOSS, Edward O. (Nov. 29, 1890), Assistant Treasurer, Scovill Manufacturing Co., 117 Pine St., Waterbury, Conn.

GRAVES, Edwin D. (Oct. 25, 1895), Civil Engineer, Hartford, Conn.

GREEN, Walter P. (Feb. 19, 1918), Civil Engineer, Scovill Manufacturing Co., Waterbury, and *for mail,* 15 Plank Road, Waterbury, Conn.

GREENWOOD, Albert H. (Feb. 9, 1904), Greenwood & Noerr, Consulting Engineers, 847 Main St., Hartford, Conn.

GREGORY, J. Louis (Aug. 10, 1904), General Contracting, 5 Lake Ave., Greenwich, Conn.

GUPPY, Joseph S. (Feb. 17, 1920), Estimator, The H. Wales Lines Co., Meriden, Conn.

HALL, A. Clark (Jan. 8, 1901), Civil Engineer, Bloomfield, Conn.

HALL, Charles Ernest (Feb. 12, 1907), Civil Engineer, Third Ave. Railroad Co., 2396 Third Ave., New York, N. Y.

*HALL, George B. (Feb. 10, 1914), Civil Engineer, Waterbury, Conn.

HALL, William H. (Feb. 12, 1907), City Engineer, New Britain, Conn.

HALTON, William (Associate, Aug. 7, 1918), 527 West Main St., Mt. Vernon, N. Y.

HAM, George C. (Aug. 17, 1909), Civil Engineer, 98 Church St., Naugatuck, Conn.

HAMILL, Charles B. (Feb. 18, 1919), P. O. Box 785, Bridgeport, Conn.

HAMLIN, George E. (Aug. 12, 1915), State Highway Department, State Capitol, Hartford, and *for mail,* 24 May St., Hartford, Conn.

HANS, Alexander Joseph (Feb. 12, 1907), Chief Engineeer, Piping Rock Estates, Locust Valley, Long Island, N. Y.

HART, Jonathan T. (Feb. 15, 1916), Superintendent, Berlin Construction Co., Berlin, Conn.

HARTE, Charles Rufus (Aug. 10, 1904), Construction Engineer, The Connecticut Company, New Haven, Conn.

HASTINGS, Frederick B. (Associate Member, Feb. 10, 1903), B. D. Pierce Co., Bridgeport, Conn.

HAVEN, Ralph DeW. (Feb. 8, 1910), Civil Engineer, East Norwalk, Conn.

HAWLEY, Arthur S. (Feb. 11, 1902), C. W. Blakeslee & Sons, New Haven, Conn., or 193 Maple St., New Haven, Conn.

HEAD, Orrin W. (Feb. 15, 1916), Secretary, The R. D. Daley Co., 6 Church St., New Haven, Conn.

HELLWIG, Gustav A. (Feb. 17, 1920), Assistant Engineer, N. Y., N. H. & H. R. R., Real Estate Department, 306 Capitol Ave., Bridgeport, Conn.

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* Mail returned. New address wanted.

HENDERSON, John T. (July 18, 1899), Chief Engineer, Connecticut River Bridge and Highway District, 756 Main St., Hartford, Conn.

HERBST, Abram W. (Associate, Aug. 7, 1918), General Manager, The New England Slag Co., Canaan, Conn.

HELSTED, Charles W. (Associate Member, Feb. 27, [illegible]), The Berlin Construction Co., Berlin, and *for mail*, 126 Warrenton Ave., Hartford, Conn.

HEWLETT, William S. (Associate Member, Feb. 20, 1917), Sagal Bldg., Bridgeport, Conn.

HICKEY, William F. (Feb. 9, 1909), Care of Carnegie Steel Co., Boston, Mass.

HILL, Albert B. (Jan. 9, 1900), Consulting Civil Engineer, 100 Crown St., New Haven, Conn.

HILLHOUSE, T. Curtis (Feb. 14, 1912), Civil Engineer, Bureau of Engineering, New Haven, Conn.

HINE, Frank E. (April 20, 1901), Superintendent, E. M. & W. Ferguson, Fishers Island, N. Y.

HOHENTHAL, Emil L. G., Jr. (Aug. 13, 1913), Building Contractor, The J. H. Grozier Co., 721 Main St., Hartford, and *for mail*, 33 Ridgewood St., South Manchester, Conn.

HOLBROOK, C. G. Harold (Feb. 13, 1912), City Engineer's Office, New Haven, Conn.

HOLLIS, Eben C. (Feb. 19, 1918), 36 Silver St., Waterbury, Conn.

HOLLEY, Irving B. (Associate Member, Feb. 17, 1920), General Contracting, Torrington, Conn.

HOSLEY, Robert M. (Aug. 23, 1905), Assistant Engineer, N. Y., N. H. & H. R. R. Co., New Haven, and *for mail*, 304 Ferry St., New Haven, Conn.

HOWARD, Frank W. (Feb. 17, 1920), City Engineer's Office, Bridgeport, and *for mail* 643 Central Ave., Bridgeport, Conn.

HOYT, Samuel W., Jr. (Feb. 9, 1904), Civil Engineer, 79 Washington St., South Norwalk, Conn.

HUBBARD, Charles E. (Associate Member, Aug. 17, 1909), 160-170 Front St., Hartford, Conn.

HULBERT, R. S. See "Honorary Members."

HULL, William H. (Aug. 11, 1914), Civil Engineer, The T. A. Scott Co., Inc., New London, and *for mail*, 333 Ocean Ave., New London, Conn.

HYMEN, Henry N. (Aug. 11, 1920), Inspector of Highways, State Highway Department, 95 Elliott St., New Haven, Conn.

INESON, Frank (Feb. 19, 1918), Civil Engineer, Scovill Manufacturing Co., 310 Lincoln St., Waterbury, Conn.

INGE, Reginald G. (Associate Member, Feb. 17, 1920), The Robinson Clay Product Co., New York, N. Y., and *for mail*, 329 Central St., Springfield, Mass.

JACKSON, J. Frederick (Jan. 9, 1900), Consulting Engineer, 185 Church St., New Haven, Conn., Director of Bureau of Sanitary Engineering, State Department of Health, Hartford, Conn.

JARVIS, Charles M. See "Honorary Members."

JAYNES, Frank B. (Feb. 10, 1903), Frank B. Jaynes, Inc., 201 Watson Bldg., Bridgeport, Conn.

JOHNSON, Frederick H. (Feb. 18, 1919), 1846 Superior St., Toledo, Ohio.

JOHNSON, James F. (Feb. 17, 1920), Engineering Department, N. Y., N. H. & H. R. R., 1119 Central Ave., Bridgeport, Conn.

JOHNSON, Wm. D. (Aug. 14, 1900), President, Johnson & Burns, Inc., Architects, 26 State St., Hartford, Conn.

JOHNSON, William E. (Nov. 29, 1890), Division Engineer, Water Dept., Hartford, and *for mail*, West Hartford, Conn.

JOHNSTON, Merwin M. (Aug. 8, 1917), Civil Engineer, Connecticut Co., and *for mail*, 191 Alden Ave., New Haven, Conn.

JONES, Walter A. (Feb. 10, 1903), Civil Engineer, Altoona, Pa.

JONES, Walter M. (Associate Member, Feb. 15, 1916; Active Member, Feb. 17, 1920), Civil Engineer, 21 Silver St., Middletown, Conn. P. O. Box 924.

JORDAN, James O., Jr. (Associate Member, Aug. 11, 1920), Waldo Bros. & Bond Co., Boston, and *for mail,* 38 Lindsey St., Dorchester 24, Mass.

KEITH, Herbert C. (Jan. 9, 1900), Consulting Engineer, 13 Park Row, New York, N. Y.

KELLEY, Raymond E. (Feb. 15, 1916), Civil Engineer, The J. H. Ellison Construction Co., Hartford, and *for mail,* 33 Stirling St., Hartford, Conn.

KELLOGG, Henry J. See "Honorary Members."

KELLY, P. James (Associate Member, Feb. 17, 1920), The Connecticut Quarries Co., New Haven, and *for mail* 161 West Rock Ave., New Haven, Conn.

KENNEDY, Dennis A. (Associate Member, Aug. 13, 1913), 715 Tremont Bldg., 23 Tremont St., Boston, Mass.

KENT, Gilbert R. (Aug. 16, 1910), Civil Engineer, 71 Smith St., West Haven, Conn.

KENYON, Herbert W. (Feb. 17, 1920), U. S. Engineer, River and Harbor Work, R. D. No. 1, Waterford, Conn.

KERR, John J. (Associate Member, Aug. 11, 1920), Bridge and Track Work, Stevenson, Conn.

KILBY, Charles C. (Feb. 14, 1912), Superintendent A. C. Sternberg, Inc., West Hartford, Conn., and *for mail,* 148 Madison St., Hartford, Conn.

KIMBALL, Paul P. (Feb. 17, 1920), City Engineer's Office, Hartford, Conn.

KIRBY, Richard Shelton (March 30, 1900), Assistant Professor of Drawing and Descriptive Geometry, Sheffield Scientific School, Yale University, New Haven, and *for mail,* 96 Linden St., New Haven, Conn.

KNOX, Chester A. (Feb. 17, 1920), Designing and Mapping Track Layouts, N. Y., N. H. & H. R. R., Madison, Conn.

KROMER, Frank (Aug. 16, 1910), Civil Engineer, 1147 Fulton St., New York City.

LA FORGE, Frederick W. See "Honorary Members."

LAMBERT, Edward Allyn (Feb. 10, 1914), Chief Engineer, The Austin Company, Bridgeport, Conn.

LANE, E. LeRoy (Jan. 8, 1901), Contractor, Hingham, Mass.

LANE, John J. (Feb. 17, 1920), Director of Public Works, New Haven. P. O. Box 733, New Haven, Conn.

LANGDON, Frederick S. (Aug. 11, 1920), Secretary and Treasurer, Bilderbeck & Langdon, Architects and Engineers, New London, Conn.

LARRABEE, Harold D. (Feb. 17, 1920), General Manager, The Eastern Connecticut Power Co., Norwich, and *for mail* 77 McKinley Ave., Norwich, Conn.

LATHROP, James (Associate Member, Feb. 17, 1920), The Lathrop & Shea Co., New Haven, and *for mail,* Branford, Conn.

LAW, Walter H. (Aug. 10, 1904), Civil Engineer, Tiverton, R. I.

LAWLER, Edward Stanley (Feb. 18, 1919), Connecticut State Highway Department, New Milford, Conn.

LEIGHTON, Kenneth W. (Feb. 14, 1911), Consulting Engineer, 82 Church St., New Haven, and *for mail,* 317 Edgewood Ave., New Haven, Conn.

LEOPOLD, Benjamin (Feb. 14, 1912), Civil Engineer, Waterbury, Conn.

LEWIS, George B. (Aug. 11, 1920), Civil Engineer, North Haven, Conn.

LEWIS, Merton B., Jr. (Feb. 17, 1920), Assistant Superintendent, The H. Wales Lines Co., Meriden, Conn., and *for mail,* 7 Walnut St., Westerly, R. I.

LINKS, Leo (Feb. 17, 1920), Links & Links, Real Estate and Engineering, 95 Linden St., New Haven, Conn.

LOCHRIDGE, Elbert E. (Aug. 23, 1905), Chief Engineer, Water Works, Springfield, and *for mail,* Box 1238, Springfield, Mass.

*LONGDEN, Ruel H. (Feb. 15, 1916), Civil Engineer, 146 Cowles St., Bridgeport, Conn.

LUTZ, Frederick W. (Feb. 10, 1914), Civil Engineer, 96 Hobart St., New Haven, Conn.

LYLES, Henry E. (Feb. 17, 1920), Connecticut Power Co., Housatonic Division, Canaan, Conn.

LYNCH, Alexander S. (Aug. 14, 1907), Engineer and Designer of Amusement Parks, 57 Holmes Street, West Haven, Conn.

LYON, Charles F. (Feb. 17, 1920), Assistant Engineer, N. Y., N. H. & H. R. R. Co., 416 Dixwell Ave., New Haven, Conn.

MACDONALD, John A. (Feb. 18, 1919), Inspector N. Y., N. H. & H. R. R. Telegraph Department, 164 White St., Hartford, Conn.

MACKENZIE, A. Maxwell (Aug. 7, 1918), P. O. Box 406, Yalesville, Conn.

MacKENZIE, Samuel H. (Feb. 9, 1915), Engineer and Superintendent, Water Department, Southington and Terryville Water Co., 102 Center St., Southington, Conn. P. O. Box 336.

MacKENZIE, William A. (Aug. 11, 1914), Borough Engineer and Superintendent Water Department, Wallingford, Conn.

MacKENZIE, William P. (Feb. 17, 1920), Assistant Engineer, Maintenance of Way, N. Y., N. H. & H. R. R., New Haven, and *for mail*, 1251 Quinnipiac Ave., New Haven, Conn.

MacLEAN, George H. (Feb. 9, 1904), Treasurer, The Sperry Engineering Co., 82 Church St., New Haven, and *for mail*, 56 Brownell St., New Haven, Conn.

MACONI, C. Vincent (Feb. 17, 1920), Estimating Engineer, Dwight Building Co., 462 Second Ave., West Haven, Conn.

MAGILL, C. A. (Aug. 14, 1907), General Manager, Connecticut Hassam Paving Co., 902 Chapel St., New Haven, Conn.

MAGUIRE, John P. (Associate Member, Feb. 15, 1916), Civil Engineer, 50 Arch St., New Britain, Conn.

MANVILLE, E. Perry (Feb. 14, 1912), Mohawk Mining Co., 15 William St., New York City, and *for mail*, 187 Elm St., New Rochelle, N. Y.

MARCHANT, Orson H. (Feb. 14, 1905), Civil Engineer, 100 Crown St., New Haven, and *for mail*, 241 Alden Ave., New Haven, Conn.

McCARTHY, Edward A. (Feb. 15, 1916), Civil Engineer, 158 Black Rock Ave., New Britain, Conn.

McCARTHY, Timothy D. (Associate, July 30, 1919), Roadmaster Connecticut Co., Waterbury, Conn.

McCLUSKEY, Charles A. (Aug. 13, 1913), Special Agent, Southern New England Telephone Co., Hartford, and *for mail*, 154 Hallock Ave., New Haven, Conn.

McCLUSKEY, Trevor P. (Feb. 17, 1920), City Engineer's Office, New Haven, Conn.

McDONALD, Charles E. (Feb. 14, 1912), 114 Benedict St., Waterbury, Conn.

McDONOUGH, Frank T. (Feb. 10, 1914), Field Engineer, Southern New England Telephone Co., New Haven, and *for mail*, 38 Hallock St., New Haven, Conn.

McDOWELL, Allan (Feb. 17, 1920), Civil Engineer, Kent, Conn.

McDOWELL, Edwin T. (Aug. 8, 1917), Superintendent Water Department, Middletown, Conn.

McELROY, James A. (Feb. 9, 1909), City Engineer, and *for mail*, 307 Golden Hill, Bridgeport, Conn.

McINTOSH, Harold S. (Feb. 17, 1920), Drafting Work in Chief Engineer's Room, N. Y., N. H. & H. R. R., 314 General Office Bldg., New Haven, Conn.

McKAIG, F. Paul (Aug. 11, 1914), Civil Engineer, The Connecticut Co., Hartford, and *for mail*, 182 Whitney St., Hartford, Conn.

McKENZIE, Thomas (Feb. 12, 1907), Engineer and Superintendent, Water Department, Westerly, R. I.

McKNIGHT, John T. (May 31, 1893), Retired from business, Rockville. Residence, Ellington, Conn.

McLAUGHLIN, Frank (Feb. 15, 1916), Civil Engineer, The Foundation Co., P. O. Box 204, Wheeling, W. Va.

MEEKER, Reginald C. (Feb. 9, 1915), Civil Engineer, So. New Eng. Tel. Co., New Haven, Conn.

ME[illegible], [illegible] (Feb. [illegible]), City Engineer's Office, New Britain, and [illegible] North Haven, Conn.

MERRELS, Charles W. (Jan. 9, 1900), Assistant Engineer, City Engineer's Office, New Haven, Conn.

MERRITT, Malcolm (Aug. 12, 1908) Daly & Merritt, Contracting Engineers, Port Chester, N. Y.

MESSIER, Charles J. (Feb. 17, 1920), The C. A. Sibley Co., 962 Chapel St., New Haven, Conn.

MILLER, Irving C. (Feb. 19, 1918), Assistant Superintendent of Construction, Scovill Manufacturing Co., Waterbury, Conn.

MILLER, Rodney B. (Feb. 9, 1909), Civil Engineer, 222 Hamilton St., Harrisburg, Pa.

MINOR, Edward E. (Feb. 9, 1904), Superintendent, New Haven Water Co., New Haven, Conn.

MINOR, Pierpont L. (Feb. 11, 1913), Assistant Engineer, S. E. Minor, Greenwich, Conn.

MINOR, Sheldon E. (Sept. 25, 1886), Civil Engineer, 96 Greenwich Ave., Greenwich, Conn.

MITCHELL, R. E. (Jan. 9, 1900), City Engineer, 751 Main St., Willimantic, Conn.

MIX, Albert F. (Aug. 11, 1920), Wreckmaster, The T. A. Scott Co., Inc., New London, and *for mail,* 14 Perry St., New London, Conn.

*MOONEY, James F. (Feb. 9, 1915), Civil Engineer, Thompsonville, Conn.

MOORE, William Harley (Jan. 9, 1900), Engineer of Structures, N. Y., N. H. & H. R. R., New Haven, Conn.

MOREHOUSE, Allison F. (Associate Member, Aug. 8, 1916), Superintendent of Buildings, 22 Church St., Meriden, and *for mail,* 14 Breckenridge Ave., Meriden. Conn.

MOSS, Ernest B. (April 20, 1901), Civil Engineer, H. Wales Lines Co., Meriden, Conn.

MUNSON, Clarence A. (Feb. 17, 1920), Engineer, New Haven Trap Rock Co., New Haven, and *for mail,* 1426 Boulevard, New Haven, Conn.

MURPHY, Harold T. (Feb. 9, 1904), Civil Engineer and Surveyor, 54 Winthrop St., Springfield, Mass.

MURPHY, John P. (July 18, 1899), Assistant Engineer, Department of Engineering, Hartford, and *for mail,* 39 Wethersfield Ave., Hartford, Conn.

MURRAY, Henry H. (Feb. 17, 1920), Electrical Engineer, The Eastern Connecticut Power Co., Norwich, Conn.

MYLCHREEST, George L. (Feb. 15, 1916), Designing Engineer, Ford, Buck & Sheldon, Hartford, and *for mail,* 238 Palm St., Hartford, Conn.

NASH, George E. (Feb. 17, 1920), Real Estate Engineer, N. Y., N. H. & H. R. R., 56 Lake Pl., New Haven, Conn.

NASH, Paul (Jan. 9, 1900), City Engineer, Stamford, Conn.

NETTLETON, Edward S. (Feb. 17, 1920), Acting City Engineer, New Haven, Conn.

NEWLANDS, James A. (Feb. 15, 1916), President, Henry Souther Engineering Co., 11 Laurel St., Hartford, Conn.

NEWMAN, Alden G. (Feb. 20, 1917), Member of Office Force A. B. Hill, 100 Crown St., New Haven, Conn.

NICHOLS, Morris B. (Feb. 18, 1919), Civil Engineer, 24 Crescent St., Shelton, Conn.

NICKELS, Herbert L. (Feb. 18, 1919), Engineer, Highway Construction, West Hartford, Conn.

NOERR, Robert Collyer, Greenwood & Noerr, Consulting Engineers, 847 Main St., Hartford, Conn.

O'CONNOR, Don (Associate Member, Feb. 9, 1904), General Contractor, 720 Main St., Hartford, Conn.

OLMSTED, Horace B. (Feb. 20, 1917), Assistant Engineer, State Highway Department, *mail,* Darien, Conn.

OLMSTED, C. Henry (July 18, 1899), Civil Engineer, 1175 Main Street, East Hartford, Conn.

ORROK, Geo. A. (Feb. 9, 1909), Consulting Engineer, 17 Battery Place, New York, N. Y., and *for mail,* Irving Pl. and 15th St.

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* Mail returned. New address wanted.

PALMER, Shepard B. (Jan. 8, 1895), Civil Engineer, 161 Main St., Norwich, Conn.

PALMER, William B. See "Honorary Members."

PARKER, George A. (July 18, 1890), Superintendent of Parks, Hartford, Conn.

PARSONS, Harold A. (Aug. 14, 1900), Civil and Consulting Engineer, Engineering Contractor, 49 Bank St., Stamford, Conn.

PATIENCE, Frederick G. (Feb. 9, 1909), Contracting Engineer, Berlin Construction Co., Berlin, and *for mail,* 25 Plainfield St., Hartford, Conn.

PATTERSON, Charles A. (Feb. 11, 1913), City Engineer, Torrington, Conn.

PATTON, Arthur J. (Sept. 12, 1889), Land Surveyor, 27 West Main St., Waterbury, Conn.

PAYNE, Morris B. (Feb. 14, 1911), Payne & Adams, Architects and Engineers, State St., New London, Conn.

PEARSON, Edward J. (Feb. 17, 1920), President, N. Y., N. H. & H. R. R. 207 Railroad Bldg., New Haven, Conn.

*PECK, Clifford A. (Aug. 12, 1915), Civil Engineer, New London, Conn.

PECK, Ermon M. (Jan. 8, 1895), Civil Engineer, 260 Edgewood St., Hartford, Conn.

PECK, Leon F. (Oct. 11, 1902), Superintendent of Streets, Hartford, Conn.

PENFIELD, George W. (Jan. 8, 1901), Assistant Engineer, Board of Water Commissioners, Hartford, and *for mail,* New Hartford, Conn.

PERRY, George W. (Aug. 11, 1914), Civil Engineer and City Engineer, City of Putnam, 15 Providence St., Putnam, Conn.

PHELPS, Howard E. (Aug. 8, 1917), Civil Engineer, New Haven, Conn.

PHELPS, James W. (Oct. 11, 1902), Landscape Architect, Bolton, Conn.

PHILLIPS, J. Warne (Feb. 17, 1920), Connecticut & Rhode Island Co., Inc., Contractors, Meriden, and *for mail,* 30 Hobart St., Meriden, Conn.

PHILLIPS, Theodore F. (Associate, Aug. 7, 1918), Meriden, Conn.

PIERCE, Bradford D., Jr. (Aug. 23, 1905), President, The Connecticut Quarries Co., New Haven, and *for mail,* Brooklawn Park, Bridgeport, Conn.

PITCHER, Floyd J. (Feb. 20, 1917), Assistant Engineer of Structures, N. Y., N. H. & H. R. R., [illegible] Church St., New Haven, and *for mail,* [illegible] S. Woodbridge St., New Haven, Conn.

POLAND, Edwin W. (Aug. 8, 1917), Superintendent, C. W. Murdock Co., New Haven, Conn.

POMEROY, Harlan D. (Aug. 8, 1916), Assistant Engineer, Town Engineer's Office, West Hartford, and *for mail,* 66 Imlay St., Hartford, Conn.

PORISS, Solomon C. (Aug. 13, 1913), Connor & Poriss, Hartford, and *for mail,* 54 Oakland Terrace, Hartford, Conn.

PRANN, C. Perry (Aug. 8, 1916), City Engineer, Meriden, Conn.

PRANN, Raymond (Aug. 8, 1917), Civil Engineer, Connecticut Co., Branford, Conn.

PRENTIS, Hugh L. (Feb. 10, 1914), Groton, Conn.

PRESTON, Charles H., Jr. (Feb. 12, 1907), Architect & Engineer, 136 Grand St., Waterbury, Conn.

PRICE, Charles E. (Associate Member, July 30, 1919; Active Member, Feb. 17, 1920), Engineer on Road Construction, Portland Cement Association, P. O. Box 1068, New Haven, Conn.

PUNDERFORD, John K. (Jan. 9, 1900), Vice President and General Manager, The Connecticut Co., P. O. Box 1311, New Haven, Conn.

QUAY, John P. (Aug. 12, 1915), Structural Engineer, Berlin Construction Co., Berlin, and *for mail,* 10 Camp St., New Britain, Conn.

RANDLE, Jonathan S. (Feb. 14, 1911), Civil Engineer, 100 Crown St., New Haven, and *for mail,* 227 Sherman Ave., New Haven, Conn.

RAPUANO, Joseph H. (Aug. 11, 1914), Civil Engineer, Connecticut Co., New Haven, and *for mail,* 878 Howard Ave., New Haven, Conn.

RASK, Peter K. (Feb. 15, 1916), Transitman, City Engineer's Office, Hartford, and *for mail,* 17 Crown St., Hartford, Conn.

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* Mail returned. New address wanted.

RICE, Alfred H. (Associate Member, Feb. 18, 1919), New Britain, Conn.

RICE, Arthur W. See "Honorary Members."

RICH, Richard H. (Aug. 11, 1914), Assistant Engineer, Department of Real Estate, N. Y., N. H. & H. R. R., New Haven, and *for mail,* 414 Goffe St., New Haven, Conn.

RICHARDS, Howard S. (Aug. 11, 1914), Civil Engineer, Huntington St., New London, Conn.

RIPLEY, Herbert L. (Feb. 17, 1920), Corporation Chief Engineer, N. Y., N. H. & H. R. R., 350 Chestnut St., Brockton, Mass.

ROBINSON, Leoni W. (Feb. 14, 1905), Architect, 42 Church St., New Haven, Conn.

ROBINSON, Ralph M. (Aug. 8, 1917), Civil Engineer, New Haven, Conn.

ROBINSON, Seymour N. (Feb. 9, 1904), Vice President and Treasurer, Berlin Construction Co., Berlin, and *for mail,* 145 Oxford St., Hartford, Conn.

ROBINSON, Wayne (Associate Member, Aug. 7, 1918), The Connecticut Construction Co., Meriden, Conn.

ROGERS, Charles E. (Feb. 12, 1907), Professor, Civil Engineering, Trinity College, Hartford, Conn.

ROOT, S. Leonard (Feb. 17, 1920), Superintendent of Highways, Fairfield, Conn.

ROSS, Robert J. (Feb. 9, 1915), Assistant City Engineer, Municipal Building, Hartford, and *for mail,* 575 New Britain Ave., Hartford, Conn.

ROWLAND, Henry L. (Feb. 18, 1919), City Hall, Bridgeport, Conn.

RUDD, E. Irvine (Aug. 7, 1918), Engineer, Public Utilities Commission, Maple Ave., Glenbrook, Conn.

RUTHERFORD, Arthur N. (Associate, Feb. 18, 1919), Building Inspector, 620 Stanley St., New Britain, Conn.

RYDER, E. M. T. (Jan. 9, 1900), Engineer, Maintenance of Way, Third Avenue Railway Co., New York, N. Y.

SAGE, George H. (Jan. 8, 1805), President, Berlin Construction Co., Berlin, and *for mail,* Ledyard Road, Hartford, Conn.

SAUNDERS, Richard L. (Feb. 9, 1909), Deputy State Highway Commissioner, State Capitol, Hartford, and *for mail,* 232 Sigourney St., Hartford, Conn.

SAVILLE, Caleb M. (Aug. 12, 1915), Chief Engineer, Board of Water Commissioners, 1026 Main St., Hartford, Conn.

SCHILLING, Albert H. (Aug. 14, 1906), Contracting Engineer, Berlin Construction Co., New Britain, and *for mail,* 29 Lincoln St., New Britain, Conn.

SCHREWE, Erwin W. (Aug. 12, 1915), Assistant Engineer, Scofield & Ford Co., 952 Main St., Bridgeport, Conn.

SCOTT, Thomas A. (Aug. 11, 1914), Contracting Engineer, New London, Conn.

SEARS, Selden P. (Feb. 14, 1912), C. W. Blakeslee & Sons, Colchester, Conn.

SEGUR, Raymond H. (Feb. 20, 1917), Overseer, Street Dept., Municipal Building, Hartford, and *for mail;* 67 Farmington Ave., Hartford, Conn.

SELLERS, Philip (Feb. 9, 1904), Architect, 207 Orange St., New Haven, and *for mail,* 227 McKinley Ave., New Haven, Conn.

SELLNER, William J. (Associate Member, Feb. 17, 1920), Office of Construction Engineer, Connecticut Co., 58 Whalley Ave., New Haven, Conn.

SENIOR, Samuel P. (Feb. 17, 1920), Chief Engineer and Vice President, Bridgeport Hydraulic Co., 820 Main St., Bridgeport, Conn.

SHARP, W. H. (Aug. 11, 1914), Town Engineer and Foreman of Public Works, West Hartford, Conn.

SHAUGHNESSY, James F. (Feb. 11, 1902), Assistant Engineer, Board of Water Commissioners, Hartford, Conn.

SHAUGHNESSY, William J., Jr. (Associate Member, Feb. 17, 1920), General Manager, Eastern Engineering & Construction Co., 304 Olive St., Derby, Conn.

SHELDON, Paul (Feb. 12, 1907), Ford, Buck & Sheldon, Inc., Consulting Engineers, Hartford, and *for mail,* P. O. Box 184, Hartford, Conn.

SHEPHERD, Edward W. (Aug. 11, 1920), The T. A. Scott Co., Inc., New London, Conn.

SHOOK, Berton (Feb. 15, 1916), Civil Engineer, City Hall, Bridgeport, and *for mail*, [illegible] Blakeman Pl., Stratford, Conn.

SIBLEY, Charles A. (Feb. 11, 1908), Contracting Engineer, 902 Chapel St., New Haven, Conn.

SKILTON, Henry I. (Aug. 8, 1917), Civil Engineer, 103 Allen Pl., Hartford, Conn.

SMEAD, Ralph A. (Feb. 15, 1916), Structural Engineer, Ford, Buck & Sheldon, Inc., Hartford, Conn.

SMITH, Frank M. (Aug. [illegible], 19[illegible]), Engineer, C. W. Blakeslee & Sons, [illegible] Orange St., New Haven, Conn.

SMITH, George E. (Feb. 10, 1903), Division Engineer, State Highway Department. Bank Building, New Milford, Conn.

SMITH, Lewis L. (Aug. [illegible], 19[illegible]), Manager, The L. A. Scott Co., Inc., New London, and *for mail*, 545 Ocean Ave., New London, Conn.

SMITH, John Henry (Feb. 18, 1919), State Highway Department, 519 Chamber of Commerce Bldg., New Haven, Conn.

SMITH, William G. See "Honorary Members."

SOEHRENS, J. H. (Aug. 10, 19[illegible]), Valuation Engineer, N. Y., N. H. & H. R. R., Wallingford, Conn.

SPENCER, Norman C. (Jan. 8, 1901), Spencer & Washburn, Civil Engineers, 573 Main St., Hartford, Conn.

SPENCER, Paul B. (Feb. 9, 1915), Engineer of Structures, N. Y., N. H. & H. R. R., 132 Richards St., West Haven, Conn.

SPENCER, Walter T. (Jan. 9, 1900), Superintendent, N. Y., N. H. & H. R. R., Taunton, and *for mail*, 127 Stathmere Road, Brighton, Mass.

SPERRY, A. William (Jan. 9, 1900), Contracting Engineer, 82 Church St., New Haven, Conn.

SPRAGUE, John V. (Feb. 11, 1913), Engineering Contractor, The Union Paving Co., Wilmington, Del.

STARK, Melvin E. (Aug. 11, 1914), Superintendent of Tracks, The Connecticut Co., Bridgeport, *mail*, 3335 Main St., Stratford, Conn.

STARKWEATHER, Walter H. (Feb. 11, 1913), Civil Engineer, P. O. Box 78[illegible], Bridgeport, Conn.

STEELMAN, Martin Somers (Feb. 15, 1916), Resident Engineer, Levering & Garrigues, Bristol, Conn., *mail*, 73 Vernon St., Hartford, Conn.

STERLING, Paul (Oct. 11, 1902), Division Engineer, N. Y., N. H. & H. R. R., East 132d St., and Willis Ave., New York, N. Y., and *for mail*, 154 Savin Ave., West Haven, Conn.

STEVENS, Robert W. (Feb. 8, 1910), Division Engineer, State Highway Dept., Hartford County, *mail*, 408 Main St., Hartford, Conn.

STEWART, Alanson E. (Feb. 10, 1914), Civil Engineer, 24 Whiting Ave., Torrington, Conn.

STODDARD, Raymond French (Jan. 9, 1900), Consulting Engineer, Bridgeport, Conn.

STONE, Edward M. (July 18, 1899), Private Business, 327 Trumbull St., Hartford, Conn.

STORRS, Henry W. (Aug. 23, 1905), Hartford Iron Works, Inc., P. O. Box 1028. Hartford, Conn.

STORRS, Lucius S. (Feb. 17, 1920), President, The Connecticut Co., New Haven, Conn.

STORY, I. Franklin (Aug. 21, 1912), Resident Engineer, Waterbury, and *for mail*, 67 Montgomery St., Waterbury, Conn.

STROUT, Stanwood Philip (Aug. 8, 1917), Civil Engineer, Burnside, Conn.

SUCHER, Theodore R. (Feb. 17, 1920), Superintendent of Gas Distribution, New Haven Gas Co., Whitneyville P. O., Conn.

SULLIVAN, John M. (Aug. 10, 1904), Plant Engineer, Whittaker & Glessner Co., 2524 Archington St., Chicago, Ill.

SUMNER, Leslie G. (Feb. 17, 1920), Connecticut Highway Department, 368 Woodland St., Hartford, Conn.

SUNDERLIN, George W. (Associate Member, Feb. 14, 1911), Secretary and Treasurer, The Bridgeport Dredge & Dock Co., General Contractors, 1024 Main St., Bridgeport, Conn.

TAYLOR, Charles F. (Aug. 12, 1908), Division Engineer, State Highway Department, Hartford, and *for mail,* 48 Church St., Middletown, Conn. P. O. Box 924.

TAYLOR, George B. (Feb. 9, 1915), Designing Engineer, Berlin Construction Co., Berlin, and *for mail,* 96 Harrison St., New Britain, Conn.

TAYLOR, George Britton (Feb. 18, 1919), 101 Dwight St., New Haven, Conn.

TAYLOR, William T. (Feb. 9, 1904), Civil Engineer, 81 Sigourney St., Hartford, Conn.

TERRILL, Arthur P. (Feb. 20, 1917), Central Romana, La Romana, Dominican Republic, West Indies, and *for mail,* 226 McKinley Ave., New Haven, Conn.

TERRY, Alfred H. (Feb. 11, 1900), Civil Engineer, Bridgeport, Conn., *mail,* 886 Main St., Bridgeport, Conn.

THAYER, Merwin A. (Feb. 14, 1912), Civil Engineer, 4 Fruit St., Winsted, Conn.

THAYER, Raymond E. (Feb. 14, 1912), Civil Engineer, New London, Conn.

THOMAS, James B. (Jan. 9, 1900), Civil Engineer, 34 Capen St., Hartford, Conn.

TIPPET, Henry J. (Aug. 8, 1917), Assistant Engineer, Connecticut Co., and *for mail,* 253 Central Ave., New Haven, Conn.

TODD, James W. (Associate Member, Aug. 16, 1910), 546 State St., New Haven, Conn.

TONER, James A. (Aug. 23, 1905), Superintendent of Public Works, Meriden, and *for mail,* 99 Windsor Ave., Meriden, Conn.

TOOCKER, L. Edmund (Feb. 18, 1919), 20 North St., Milford, Conn.

TOOLE, John F. (Associate Member, Feb. 14, 1911), Toole & Sunderlin, Bridgeport, Conn.

TRACY, John C. (Jan. 9, 1900), Professor of Civil Engineering, Yale University, New Haven, and *for mail,* 345 Winthrop Ave., New Haven, Conn.

TRAVIS, Frank M. (Feb. 9, 1915), Civil Engineer, Torrington, Conn.

TROWBRIDGE, Frederick J. (Feb. 14, 1912), Field Engineer and Inspector of Construction, Hugh L. Thompson, 35 Coniston Ave., Waterbury, Conn.

TRUESDELL, Walter E. (June 11, 1898), Secretary and Vice President, J. H. Wallace & Co., Industrial Engineers, 5 Beekman St., New York City.

TUCKER, John J. (Feb. 9, 1915), Mahoney & Tucker, 29 Weybosset St., Providence, R. I.

TURNER, Albert M. (Aug. 10, 1905), Field Secretary, Connecticut State Park Commission, Northfield, Conn.

TURNER, Homer R. (Feb. 20, 1917), Superintendent and Engineer, Windsor Water Board, Windsor, Conn.

TUTTLE, Leon E. (Feb. 18, 1919), Assistant City Engineer, Stamford, Conn.

ULRICH, W. Leroy (Aug. 14, 1913), Superintendent of Repairs, State Highway Department, Hartford, and *for mail,* 101 Ridgefield Street, Hartford, Conn.

UNKELBACH, Max J. (Jan. 9, 1900), Civil Engineer and Architect, Unkelbach & Perry, 162 Main St., New Britain, Conn.

VAUGHN, Edward J. (Feb. 15, 1916), Civil Engineer, with Ford, Buck & Sheldon, Inc., 60 Prospect St., Hartford, and *for mail,* 26 Adelaide St., Hartford, Conn.

VERRILL, G. E. (Feb. 11, 1902), 582 Central Ave., New Haven, Conn.

WADHAMS, Joseph Palmer (Feb. 9, 1904), Assistant Engineer, Public Utilities Commission, 1584 Chapel St., New Haven, Conn.

WADHAMS, M. Allyn (Feb. 19, 1918), Lockwood, Greene & Co., 27 Lewis St., Hartford, *mail* 197 Adelaide St., Hartford, Conn.

WADSWORTH, A. R. (Oct. 27, 1886), Civil Engineer and Surveyor, Farmington, Conn.

WALLER, William E. (Feb. 9, 1915), Box 99, Chestnut Hill, R. F. D. No. 1, Bridgeport, Conn.

WARDWELL, Frederick S. (Feb. 9, 1904), Contracting Engineer, Stamford, Conn.

WATERMAN, Charles P. (Feb. 11, 1908), Civil Engineer, The J. H. Grozier Co., 221 Main St., Hartford, Conn.

WATERMAN, Irville D. (Feb. 19, 1918), Construction Engineer, N. Y., N. H. & H. R. R., New Haven, Conn.

WATROUS, Kenneth (Feb. 14, 1911), Civil Engineer, Groton, Conn.

WATSON, Edmund B. (Aug. 11, 1914), Civil Engineer, 98 Park Ave., Danbury, Conn.

WATSON, William C. (Feb. 17, 1920), Bridge Department, N. Y., N. H. & H. R. R., New Haven, and *for mail*, 45 Smith St., West Haven, Conn.

WATTERS, George E. (Feb. 14, 1911), Civil Engineer, 29 Darrow St., New London, Conn.

WEBB, D. J. Henry (Aug. 7, 1918), Connecticut National Pavements, Inc., 173 Orange St., New Haven, Conn.

WELDEN, Elmer C. (Feb. 18, 1919), State Highway Department, 185 Church St., New Haven, Conn.

WELLINGTON, Alexander M. (Feb. 17, 1920), City Engineer's Office, New Haven, Conn.

WELLS, Alden (Feb. 15, 1916), Assistant Engineer, Department of Engineering, Hartford, and *for mail*, 40 Freeman St., Hartford, Conn.

WHEELER, Charles A. (Jan. 8, 1901), Professor of Mathematics and Engineering for the Connecticut Agricultural College, Storrs, Conn.

WILLIAMS, John C. (Feb. 18, 1919), Civil Engineer, West Haven, Conn.

WHITAKER, Raymond B. (Associate Member, Feb. 15, 1916), Line Measurer, 195 Broadway, Room 909, New York, and *for mail*, 395 Howard Ave., New Haven, Conn.

WHITE, Howard E. (Feb. 9, 1904), Assistant Superintendent, New Haven Gas Light Co., New Haven, and *for mail*, 175 Maple St., New Haven, Conn.

WHITNEY, Eli (March 30, 1900), President, New Haven Water Co., 800 Whitney Ave., New Haven, Conn.

WHITNEY, Stephen (Associate Member, Aug. 11, 1920), Secretary and Treasurer, Connecticut National Pavements, Inc., 173 Orange St., New Haven, Conn.

WHITON, Frank W. (Associate Member, Feb. 14, 1905), Whiton & McMahon, Architects, 36 Pearl St., Hartford, Conn.

WHITTMORE, J. B. (Feb. 9, 1915), Roadmaster, Shore Line Electric Railway Co., Norwich, and *for mail*, New London Turnpike, New London, Conn.

WIGGIN, Ernest W. (March 30, 1900), Consulting Engineer, 113 Church St., New Haven, Conn.

WIGHTMAN, Herbert B. (Aug. 16, 1910), Civil Engineering, 1 Elmwood Ave., Norwich, Conn.

WILLIAMS, Harry T. (Aug. 12, 1915), Civil Engineer, Waterbury, Conn.

WILLIAMS, John C. (Feb. 18, 1919), Civil Engineer, West Haven, Conn.

WILLIAMS, Joseph D. (Feb. 15, 1916), Assistant Engineer, Department of City Engineering, New Britain, and *for mail*, 54 Garden St., New Britain, Conn.

WILLIAMS, Philip K. (Aug. 14, 1906), Secretary, J. B. Williams Co., Glastonbury, Conn.

WILSON, P. Ney (Aug. 14, 1913), Road Master, Connecticut Co., New Haven, Conn.

WINSLOW, C.-E. A. (Aug. 8, 1916), Professor of Public Health, Yale Medical School, New Haven, and *for mail*, 202 Prospect St., New Haven, Conn.

WOLCOTT, Henry A. (July 18, 1899), Mechanical and Civil Engineer, West Hartford, Conn.

WOODS, John J. (Feb. 10, 1914), Civil Engineer, Baltic, Conn.

WORTHEN, Albert Louis (Feb. 15, 1916), Superintendent, The Connecticut Quarries Co., 6 Church St., New Haven, Conn.

WRIGHT, George E. (Feb. 17, 1920), Assistant Engineer, City Engineer's Office, Bridgeport, and *for mail*, 1180 Madison Ave., Bridgeport, Conn.

WRIGHT, F. Walden (Aug. 12, 1908), Civil Engineer, Winchester Repeating Arms Co., New Haven and *for mail*, 33 Edgewood Ave., New Haven, Conn.

WYNNE, Harold G. (Feb. 17, 1920), City Engineer's Office, New Haven, Conn.

YOUNG, Guilford D. (Feb. 20, 1917), 263 Elm St., West Haven, Conn.

Geographical List of Members

Names are usually arranged under their place of business

CONNECTICUT

Fairfield County

Bridgeport—F. L. Black, W. E. Bernhard, C. H. Chapman (Assoc. M.), E. L. Dargan, L. Evans, A. D. Fuller, P. G. Goodell, C. B. Hamill, F. B. Hastings (Assoc. M.), G. A. Hellwig, W. S. Hewlett (Assoc. M.), F. W. Howard, F. B. Jaynes, J. F. Johnson, E. A. Lambert, R. H. Longden, J. A. McElroy, W. B. Palmer, B. D. Pierce, Jr., H. L. Rowland, E. W. Schrewe, S. P. Senior, B. Shook, M. E. Stark, W. H. Starkweather, R. F. Stoddard, G. W. Sunderlin (Assoc. M.), A. H. Terry, J. F. Toole (Assoc. M.), W. E. Waller, G. E. Wright.

Danbury—C. O. Brown, J. Sanders, E. B. Watson.

Darien—H. B. Olmsted.

East Norwalk—R. D. Haven.

Fairfield—H. C. Elton, S. L. Root.

Greenwich—J. W. Cone, J. L. Gregory, P. L. Minor, S. E. Minor.

Shelton—D. E. Brinsmade, M. B. Nichols.

South Norwalk—D. B. Eula, S. W. Hoyt, Jr.

Stamford—G. D. Arthur, W. H. Arthur, E. H. Beard, P. Nash, H. A. Parsons, E. I. Rudd, L. E. Tuttle, F. S. Wardwell.

Stevenson—J. J. Kerr.

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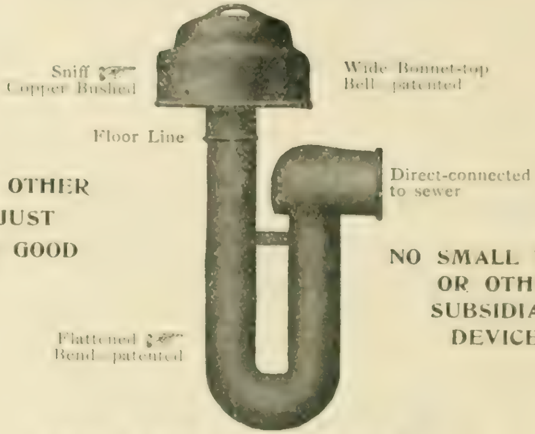

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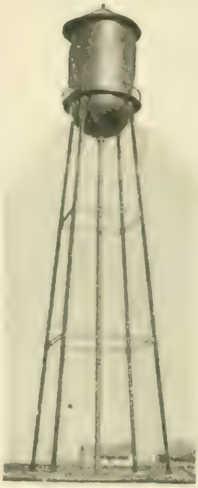

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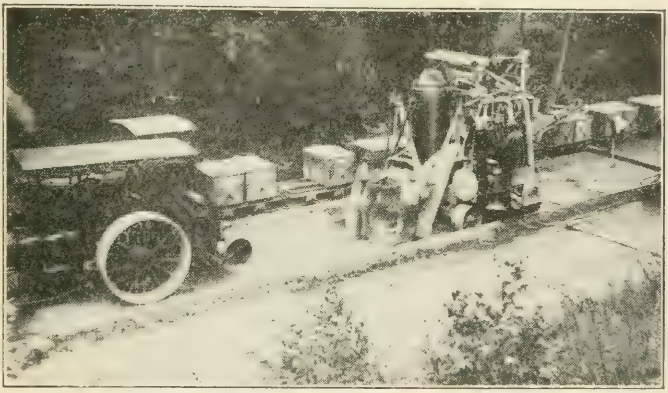

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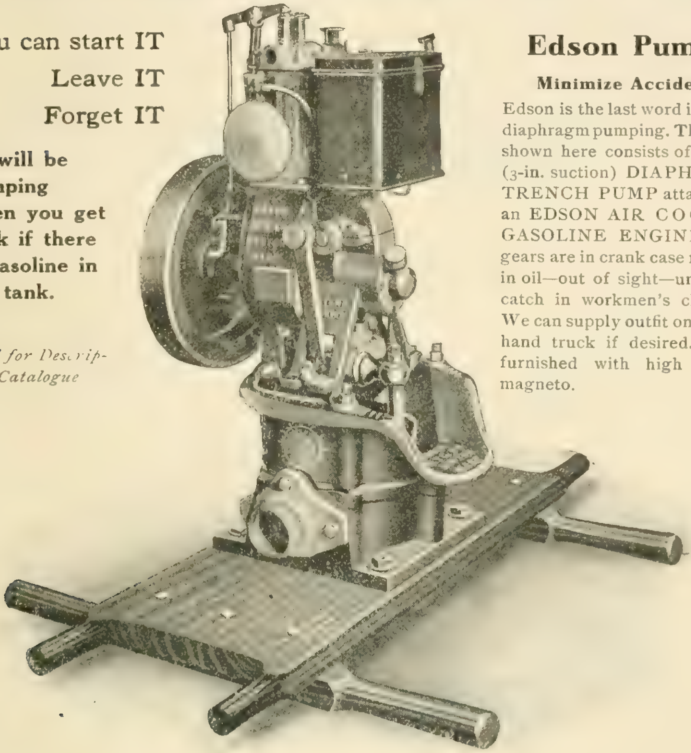

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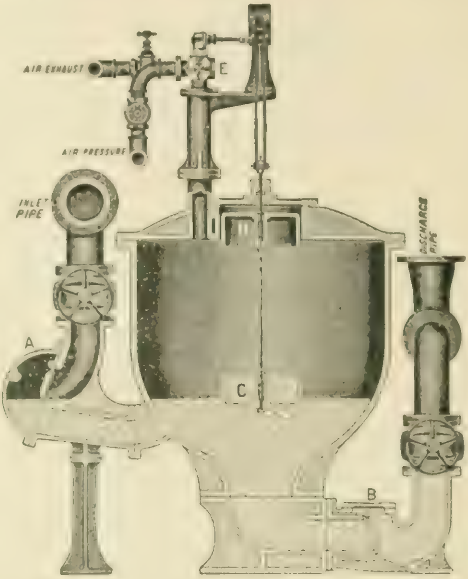

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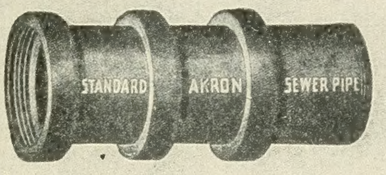

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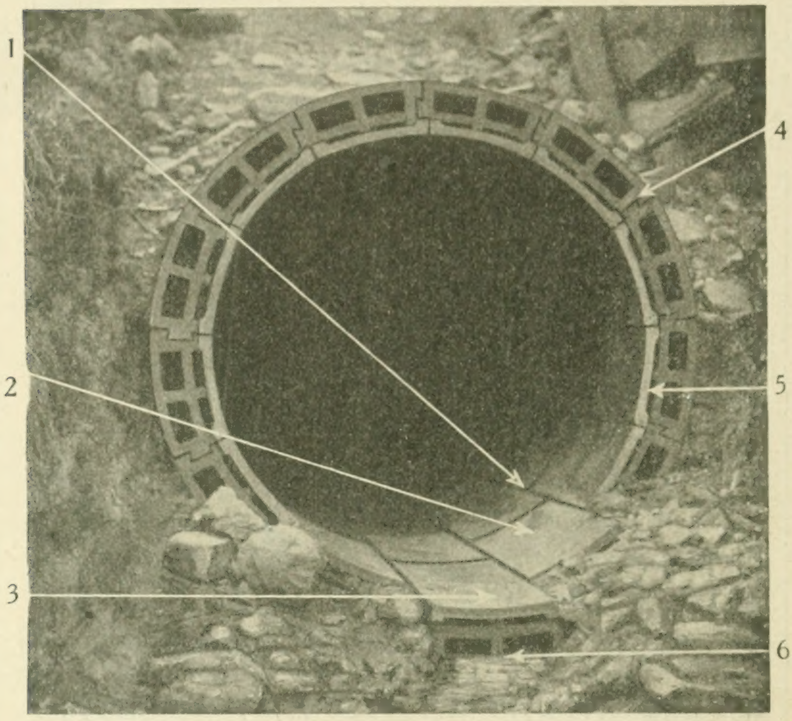

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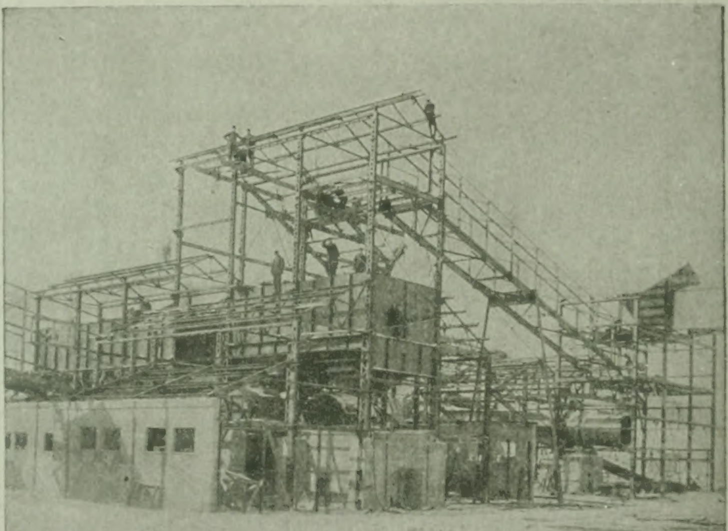

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